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REPORT OF THE

Secretary of Agriculture

1949

BENNETT T. SIMMS

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United States
Government Printing Office
Washington : 1950

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WASHINGTON, NOVEMBER 30, 1949

To the President

SURPLUSES EMERGE AS WORLD RECOVERY PROCEEDS

In 1949 the world food problem began to show its old-time dual aspect once more. It was not pressing hard, but signs were again appearing of the problem simultaneously of filling needs and getting rid of surpluses; in other words, the problem of want and plenty side by side. In the war years and in the early postwar years only shortages gave trouble; surpluses were absent. Even the United States had shortages, though its food production soared. In this country, however, as likewise in Canada and Australia and in a few other countries, the shortages were the result of choice rather than of necessity. They reflected the extent to which we had assumed responsibility for food requirements abroad.

Elsewhere food shortages were inescapable results of war; they resulted either from physical damage to production and transport, or from economic disturbances occasioned by the fighting. With few exceptions by commodities, agricultural supplies in the wartime and early postwar years were below requirements everywhere, in many cases drastically so. This ceased to be the universal picture in 1949. Food surpluses developed in some areas, with indications that soon the surplus problem might vex all agricultural exporting countries.

Some great agricultural regions, notably those of the Western Hemisphere, had difficulties with a number of important products. Large production of grains, cotton, and tobacco was putting pressure on storage space and on price supports. Even western Europe began to have surpluses here and there in some lines of agricultural production; meanwhile, its farm recovery in general lessened its dependence on food imports.

The actual surpluses which we have or anticipate having in the United States are very small in terms of the additional food needed to bring the world up to a minimum nutritional standard. Of the food commodities held by this Government today, only nonfat dry milk,

dry beans, dried eggs, and Mexican canned meat are actually surplus. Some of these surpluses would seem large in terms of pounds or some other similar measurement, but the true significance becomes clearer when they are related to actual world food needs.

Half of the world's people are undernourished. This Government's inventory of dried eggs is only large enough to supply each of these people two and one-half eggs. The maximum surpluses of all foods which we have ever had would have provided them with only a few meals. If food-exporting nations maintain large stock piles of storable foods, such as grain, the stock piles can do a great deal to alleviate famine in localized areas.

The United States Government intends to maintain larger reserves than before the war. These will protect our consumers against shortages, and will also be available for export in case of crop failures in other parts of the world. But human need is only one aspect of the surplus problem. Consumer buying power is important. It is the shortage of buying power in food deficit countries that chiefly demands attention as a means of alleviating the agricultural surplus problem.

Food was in short supply during 1949 throughout extensive areas of the world. Production was the major difficulty in Asia. Policy for agriculture necessarily tackled both aspects of the world food problem together; that of dealing with emerging surpluses in areas of great farm productivity and consequently great need for foreign markets; and that of underdeveloped agricultural countries eager to expand their farm production. The United States especially had responsibilities along both these lines.

Poverty and hunger in shortage areas cause political as well as economic instability. It is our duty and our interest to help such areas toward stability and progress. This means we must help them to increase their production, through technical and economic collaboration. Part of the job includes industrialization of underdeveloped areas. Modern farm production requires industrial backing, such as will provide farm machinery, facilities for handling farm products, nearby markets and nearby employment. Without nearby industries to give employment, it is difficult to lessen harmful land-crowding. Accordingly, along with other nations represented in the Food and Agricultural Organization of the United Nations, the United States is aiding underdeveloped countries simultaneously to expand their farming and their manufacturing.

World facts about agriculture are necessary background for facts about United States production and marketing. Without facts about the world situation, we cannot understand our own. We may begin therefore with a glance at the world picture. All reports agreed in 1949 that agricultural surpluses were emerging and might increase rapidly in the agricultural exporting countries. To handle these surpluses so as not to restrict production, consumption, and world trade would call, said the reports, for concerted international action. This was a major finding of the council of the Food and Agricultural Organization of the United Nations, whose Director General reported on the probable sizes and locations of oncoming surpluses, on their origin and development, on attendant price problems, and on anticipated effects on production, consumption, and international trade. This is a far cry from exclusive preoccupation with shortages.

Strong Export Demand for United States Products

Nevertheless, foreign demand for United States farm products held up quite well in 1949 despite improvement in world production. Surpluses were mainly a future rather than an immediate worry. In the shipping season that ended June 30, 1949, United States exports of grain broke all records. The total for the 12 months July 1948–June 1949 was about 686,074,000 bushels, as compared with 558,000,000 bushels in the 1947–48 shipping season. Many countries imported more United States corn in 1948–49 than in the previous year in order to expand their livestock industries. Our exports of cotton were larger than in any year since the war; they were 132 percent greater than those of 1947–48. Exports of tobacco exceeded those of 1947–48, with takings by the United Kingdom substantially increased. Prices of exports, however, declined moderately in the first half of 1949. Yet the agricultural exports of 1949 were higher in value, as well as in quantity, than those of 1948.

Grants and loans by the United States to foreign governments were an important favorable influence. All told, these grants seemed likely to total more than 7 billion dollars in 1949. Mounting dollar shortages abroad were a countervailing force, especially in the sterling area. Yet United States exports in the last quarter of 1949 promised to go above those of the corresponding months in 1948. Briefly we had an export breathing spell. But the period of unlimited world demand for American farm production was evidently drawing to a close.

Two facts pointed to important early change. Production of food was going up throughout the world; foreign buying power for American products was going down, as revealed by the dollar crisis. True, our grants and loans relieved the shortage of foreign buying power; but there was no hope of permanent relief through the grant and loan program. Eventually, the purchasing power represented by this program will run out. Unquestionably our export trade will suffer then, though possibly with some offset from the influence of world recovery and perhaps also from long-term American foreign lending.

After a long experimental period, the movement for international commodity agreements is picking up. An outstanding evidence was the 1949 international wheat agreement, referred to in more detail elsewhere in this report. By this agreement 41 nations agree for a 4-year period as to maximum and minimum prices, and also as to export and import quantities. This was the result of efforts started in 1933 and continued with interruptions even during the war. Proposals for other international commodity agreements are under discussion—with the principle accepted that such agreements should serve consumers as well as producers. Specifically, the problem is to stabilize prices and facilitate marketing in world trade, while meeting the desire of consumers for goods reasonably priced.

Agreement is possible because in the long run, though often after considerable unnecessary speculation and market shake-ups, the fair-price basis establishes itself. Ultimately, producers cannot keep prices at artificially high levels; consumers cannot get supplies by offering prices that are too low. The international agreement approach works to the common end directly, with much saving of time, effort, and

money. In discussions during 1949 with regard to additional international commodity agreements, an important question concerned possible disposition of surpluses among low-income groups at less than full market prices. All angles of this vital subject are due for further intensive study, among them the extent to which well-drawn international commodity agreements may help along the movement to do away with trade barriers. Such agreements, with many nations participating in them, provide a partial antidote to barter arrangements, blocked currencies, rigid import restrictions, and other tools in the trade-restriction kit.

One-Sidedness of United States Trade

Our own position, because of its one-sidedness, presents some world trade problems. After filling the requirements of a high domestic standard of living, we have surpluses for export. These are of industrial as well as agricultural origin. With quantities of farm and factory products to dispose of in world trade markets, we naturally do not want similar quantities of similar goods in exchange. Our vast and diversified resources and our highly developed techniques enable us to supply most of our wants at home. There is still great scope for world trade based on comparative advantages. Indeed, our imports are increasing. But they consist increasingly of raw materials, unfinished goods, and noncompetitive items. The sources of these goods, moreover, are chiefly elsewhere than in Europe, which has been declining in relative importance as a source of United States imports.

Here is the root of Europe's dollar shortage. In too many countries we sell but do not buy. Rational development of our tariff policy, by methods such as those authorized in recent reciprocal trade agreements, would increase the flow of imports. Nevertheless, the volume seems destined indefinitely to remain much below the volume of the exports. Hence, foreigners will continue to have difficulty in getting dollars.

Since we do not want foreign goods and services as much as other countries want ours, other countries can take our goods only to a limited extent. They do not have enough dollars to do otherwise. We ourselves are financing the current exports to a considerable extent; that is to say we are providing dollars, by means of United States grants and loans to foreign countries. Otherwise the trade would be smaller. Self-financing of this kind by the United States is not, however, a lasting basis for export trade. Tariff lowering would help and also long-term foreign lending by the United States, particularly if combined with willingness on our part to let borrower countries repay their loans eventually in goods and services. But tariff lowering and long-term foreign lending can have only a slow and gradual influence.

Our Trade With Latin America

With Latin America our commercial relationship is somewhat different from that with Europe. In the war years, while many European and Asiatic countries were depleting their dollar supplies in order to make tremendous purchases of American goods and services, the Latin American countries in many cases were in the reverse position. They were selling more to the United States than the United

States was selling to them; shipments of war materials from Latin America to the United States were heavy. On the other hand, because the United States had a war to fight, this country restricted exports to areas not allied with it in the conflict. Hence, the Latin American countries came out of the war with large dollar balances.

They began to draw upon these balances heavily, however, as soon as the United States lifted its export restrictions. Probably the trade balance will be in our favor very soon even with the Latin American countries. This means it will be favorable almost with the entire world. Few nations now have enough dollars to be able to use them without restriction in the United States. The world's shipping is not carried in foreign vessels in as great proportion now as it was before the war, and this adds to the world's difficulty in getting dollars. Briefly, the total situation presents few offsets to the immense one-sidedness of the American trade position. Hence we probably cannot maintain our exports at current levels. When our foreign-aid programs end and foreign agriculture and industry recover fully, the problem may be acute. This could be true even with a dollar situation much improved. In that event American agriculture may be in for reducing pains.

Long Evolution of Farm Export Dilemma

Our world-trade problem is not entirely of recent origin, though recent developments have sharpened it. It began more than a century ago. Originally, the United States was predominantly agricultural, and depended on Europe for industrial goods—not merely for pottery, glassware, textiles, and most other articles of comfort or luxury, but for capital goods as well. We brought steel and other products from Europe to start us in railroad building and industrial development in general. We paid with wheat, tobacco, meat, and other agricultural products. Soon, however, we became increasingly independent of Europe's factory production; practically everything Europe could produce, we could produce too, though not always in as good a quality or at as low a price. Then came another decisive change; we began to export manufactured goods.

Thereafter, manufactured articles and other commodities of nonfarm origin figured increasingly in our export trade. The old reciprocity between the United States and Europe, whereby the United States had served as the breadbasket and Europe as the workshop, was breaking down. We began to have an excess of exports over imports shortly after the Civil war; and the so-called favorable trade balance included much industrial production. By the turn of the century farm exports had started to decline in volume as well as in proportion to our total exports. The peak year in farm export trade was 1898; by 1910 it was down almost to the level of the 1880's. In that year the farm percentage of the export trade was 50 percent; by the 1930's the farm percentage was less than 25. Even World War II and its hungry aftermath did not restore United States farm export trade to its old preeminence. Since 1945 the farm proportion of the total exports has not exceeded 30 percent, though the shipments have been the largest in volume since 1920. It is evident that the declining importance of our agricultural export trade has deep historic roots.

We have noticed the fundamental cause. It may be useful to notice one or two of the associated factors. In the first place, American farm exports suffered after the turn of the century from the growth of new world competition, as well as from the difficulty Europe was beginning to have in selling goods to the United States. Agricultural progress was rapid in Canada, Argentina, Australia, and New Zealand. Our farmers had to cope with vigorous new world competition, often based on virgin land and relatively cheap labor. Soon Europe was depending heavily on Canada, Argentina, and also Russia for grains; on Argentina for beef; and on Australia and New Zealand for dairy products and for wool and mutton. It was able to trade more easily with several of these countries than with the United States, because they were not themselves equipped with factories and were consequently in a position liberally to import manufactured articles. In other words, the reciprocity that had broken down between Europe and the United States was intact between Europe and the newer agricultural exporting countries.

Another important factor in the long decline of American farm products in world trade deserves attention. When European countries began to have trouble in earning dollars, owing to the fact that this country was not as hospitable to European goods as it had been formerly, they often preferred to spend the dollars they had for American industrial rather than for American farm products. Our factory goods had come to be in great demand abroad. The like was often not to be had elsewhere. Tendencies for foreigners to prefer American factory goods have strengthened since World War II, because such goods are often indispensable to rebuild shattered transport or other facilities. Briefly, the farmers of the United States have had to cope with competition in two very difficult forms: First, the competition of newer agricultural exporting countries; and second, the competition of American manufacturers for scarce dollar exchange.

Culmination of Long Process

Slow in development, these adverse factors have nevertheless culminated swiftly. In most years before 1900 and in fact up to the time of World War I, the growing want of balance in our trade with Europe caused no serious trouble. We continued to do a heavy export trade. Exports above imports did not immediately produce a dollar shortage. This was a result chiefly of the fact that Europeans still had large investments here, on which their countries could draw to pay for American wheat, cotton, tobacco, and fruits. When World War I began, this country still owed Europe about half a billion dollars annually for principal and interest.

After World I, however, the position was the reverse; Europe was indebted to the United States to the tune of about half a billion dollars annually. And after World War II the indebtedness was much greater. Essentially, the difficulty with our foreign trade might have been foreseen; we were ceasing both to buy and to borrow from Europe and at the same time were sending goods there almost as plentifully as ever. We did not foresee the impasse, because temporarily Europe had dollars on deposit here. We see the problem now, because the dollars have run out, along with chances to replenish the supply.

In summary, the problem of American agriculture is now the problem of American trade. Continued one-sidedness in our world trade will inevitably inflict further damage on our agricultural exports; and we must not forget that the damage exists, even if we cover it up with loans and grants to foreign countries. Foreign nations are still buying more from us than they are selling to us for one reason only—we provide the money. Nevertheless, they are running out of dollars fast. One-sidedness in trade cannot continue indefinitely in any event; exports continuously above imports mean that the exporting country is not getting paid. Ultimately, unless we buy more from foreign countries, we shall not be able to do business with them at all. And then as far as we are concerned the other half of the world food problem will be likewise insoluble—the shortage half.

THE WORLD FOOD SITUATION

World food production increased substantially in 1948–49. Mainly as a result of favorable weather conditions, output of most food and feed crops was larger than in 1947–48 and above the 1935–39 average. Compared to prewar, wheat was up by about 5 percent; rice—the other great food grain—by 2 percent; coarse grains by 10 percent; sugar by 8 percent; and potatoes by 12 percent. Production of oils and fats showed some increase, but failed to reach the prewar average. Recovery in the production of meat was held back by the desire of farmers to reconstitute their herds. Milk production in the major producing countries reflected great improvement in feed supplies, and may have exceeded the prewar level.

All in all, with allowance for Europe's continuing shift of grain and potatoes from feed to food uses, it appeared that in terms of calories, the world produced somewhat more food in 1948–49 than before the war. Yet the world had also a considerably larger population. Hence the showing on a per capita basis was less satisfactory. The world's food production per capita in 1948–49 probably was from 5 to 10 percent short of the prewar level.

Most parts of the world contributed to the increase in the total food production. Output in North America, which already was far above prewar, rose still more, so that the United States and Canada were able to maintain high standards of domestic consumption and at the same time to make increased surpluses available for export.

Food production in Europe increased markedly over the low output of 1947–48 and approached the prewar average. Even in the prewar period, however, Europe had to import large quantities of food for a population considerably smaller than the present population. ECA and other foreign-aid funds bolstered foreign buying power in 1948–49. In consequence European countries were able generally to maintain food imports and raise food-consumption levels. Many countries derationed some or all foods, lowered flour-extraction rates though rarely to the prewar level, and decreased the use of coarse grain for food. Average per capita consumption in terms of calories came up to or near the prewar level. Nevertheless, the diet generally in Europe was more heavily weighted with starchy foods than before the war, and in some areas was considerably deficient in meat and fats.

Asia, the other great food-deficit region, made less progress in expanding its food production; yet its total supplies were a little larger than in 1947–48. Many urban areas in the Asiatic countries continued to suffer from severe food shortages, partly because monetary inflation and political and military conflicts hampered the movement of supplies from surplus to deficit areas. Exportable supplies of rice, vegetable oil, and sugar—the principal prewar exports—increased somewhat but remained less than half those of prewar years. On the other hand, Asia's imports of cereals and cereal products were much above prewar averages. Production of exportable products is not likely to increase greatly in most Asiatic countries under the existing political and economic conditions. Meanwhile, the rapidly increasing population will necessitate maintenance of food imports at a high level if sufficient foreign exchange can be obtained.

Conditions in Russia, Australasia, and Latin America

In 1948–49 under bilateral agreements Europe and Asia obtained some grain from the Soviet Union. A net exporter of food before the war, the Soviet Union became a net exporter again in 1947–48; yet its food production was not back to the prewar total while its population was up to or above prewar. Food conditions in Moscow and some other large Russian cities eased somewhat during the second half of 1948. Elsewhere in the Soviet Union, however, the situation was much less satisfactory. Lack of reliable information on food conditions for many important regions precluded a generalization as to the over-all situation in the Soviet Union.

High food standards were maintained in 1948–49 in most other important food-surplus countries, as in North America. Australia and New Zealand exported more food than before the war, mostly to the United Kingdom under bilateral trade agreements. This was also true of Canada and the Union of South Africa. The southern Dominions, which belong to the sterling area, were able more easily than Canada to dispose of their exportable surpluses.

Latin America, in contrast to most other parts of the world, produced less food in 1948–49 than in 1947–48. Unfavorable weather conditions sharply reduced the Argentine grain crops to a level which could not be offset by good crops in the other Latin American countries. The sugar crop for Latin America was down somewhat from last year's though still well above prewar. With domestic demand high in the food-surplus areas, exportable surpluses were reduced. Moreover, supplies were slow in moving to European markets because of foreign exchange difficulties, and also because Argentina asked extremely high prices for grain. Simultaneously, food-deficit countries in Latin America had to restrict their imports because of a shortage of foreign exchange.

FARM OUTPUT IN THE UNITED STATES

Output of all farm products in the United States in 1949 closely approached the record production of 1948. Preliminary estimates placed the aggregate crop production at second only to that of 1948. Out-turn of livestock and livestock products will exceed that of 1948 and of any other year except the war years 1943, 1944, and 1945.

Combined volume of principal crops in 1949, by late season estimates, was 30 percent more than in the 1923–32 period—only seven index points below the record 1948 total. Feed grains, as a group, with the second largest tonnage in history, were the heaviest contributors to this aggregate. Food grains, oilseeds, fruits, vegetables, and special crops were not outstanding, though the production for each group was fairly large. Rice, pears, and dry beans were record crops. Corn and soybeans were second-largest crops on record. Cotton promised to be more than 40 per cent above the average crop. Wheat, flaxseed, sorghum grain, tree nuts, cherries, and sugarcane were relatively large crops. Exceeding average production by a narrower margin were oats, tobacco, apples, peaches, hops, cranberries, and broomcorn. Below average crops included hay, barley, peanuts, potatoes, sweetpotatoes, sugar beets, apricots, rye, buckwheat, and dry peas. The latter three were very small crops.

Feed supplies for the 1949–50 feeding season will be more abundant than in any previous season, both in total and per animal unit. To large carry-over stocks, particularly of corn, will be added the second consecutive corn crop of about 3.5 billion bushels, and large tonnages of oats and sorghum grain, plus a relatively small barley crop. There was an upturn in livestock numbers in 1948. The huge feed supplies of 1949 will doubtless continue the increase. Hay was in ample supply in 1949 except in a northwestern dry area and in the Northeast, where dry, short summer pastures resulted in inroads upon winter supplies.

The food-grain tonnage of 1949, though considerably less than in 1948, was ample for domestic use and export requirements. Nearly 900 million bushels of winter wheat, along with a relatively small spring wheat crop, made the all-wheat total the fourth-largest of record. Carry-over stocks of nearly 300 million bushels of old wheat were about normal. Rice production set a new record. As mentioned, rye and buckwheat were very small crops.

Oilseed production, though much below the 1948 high mark, furnished liberal supplies, more than one-third above average. The total included the second-largest crop of soybeans and third-largest of flaxseed. Peanut tonnage limited mainly by acreage restrictions, was below average, but cottonseed may be 37 percent above average.

Deciduous fruits were produced in near-record volume, with a total of over 10 million tons. Compared with 1948, there was much larger production of apples, pears, plums, peaches, cherries, and prunes; but smaller production of grapes, apricots, and cranberries. Walnuts, almonds, and filberts were record crops and with an above-average pecan crop resulted in a large tonnage of tree nuts. The 1949–50 citrus crop will be relatively small. Production of oranges may be near the average of recent years, but grapefruit production will be smaller owing to last winter's freeze damage to trees in Texas and to an August hurricane in Florida. Supplies of fresh vegetables were abundant during the early part of the season, but tapered off to about average in the fall. The year's tonnage of fresh vegetables was slightly less than in 1948 and slightly less than the average of the previous 5 years. Truck crops for processing receded to a point well below the 1946 peak; in fact the total tonnage was less than in any year since 1941.

Weather Conditions During the Growing Season

Unusually favorable conditions for planting and early development of crops led to excellent prospects at the beginning of the crop season. On June 1 the farmers who reported to the Department on all crop prospects were more optimistic than on the same date in the 12 preceding years of similar reports.

But the early prospects were not fully realized because conditions became unfavorable in some localities for later development of the crops.

Weather conditions in the fall of 1948 had been mostly favorable for field work and farmers sowed a record acreage of winter wheat. In much of the Great Plains wheat area, wheat was retarded by lack of soil moisture and of rainfall. However, large rains and early snows improved the situation. Winter wheat emerged from its dormancy with less than usual damage, except in the Pacific Northwest, where a severe winter caused heavy loss of acreage. Fall-sown oats suffered severely from winterkilling in the Southwest, but barley and rye wintered well. Heavy winter snows left deep snow packs in the mountains which provided ample water for irrigation.

Farm work and vegetative growth, after a delay caused by cold weather in March, got off to a good start toward the end of that month and continued under favorable conditions through most of the spring. Wet fields limited spring seedings in the South Central area and delayed work in a large Missouri-Nebraska-Kansas area. Much of the backwardness was overcome, however, by later favorable conditions. Planting of corn and soybeans was nearly completed by June 1—earlier than usual.

Rains that favored spring-sown crops elsewhere brought adverse results in the Great Plains winter wheat area. Harvesting started in the southernmost areas in late May, but it was then virtually stopped for weeks by heavy rains and wet fields. Wet weather, along with associated pests and diseases, also reduced yield prospects and quality of winter wheat further to the north, with the result that the final estimate of winter wheat production was one-seventh less than the June 1 forecast.

Spring-sown grains started well but dry weather in June and a hot, dry July forced small grains to maturity in the important Montana-Dakotas area and limited the yields of spring wheat, oats, and barley. Corn, soybeans, and other later-growing crops, however, continued to flourish in most of the country. Hot, dry weather in parts of Iowa, Minnesota, and South Dakota reduced corn prospects to an extent not offset by improvements elsewhere. Nevertheless, the United States produced its second largest corn crop—nearly 3.5 billion bushels. Cotton started well, but wet weather and heavy boll weevil infestation seriously reduced production in the eastern Cotton Belt. The reduction there was only partly offset by favorable conditions in the western portion of the belt and in the Southwestern States. The total outturn of 16 million bales, slightly more than the production of 1948, was the sixth largest of record. This favorable outcome of the 1949 season was partly a result of increased availability of power machinery, which helped farmers to lessen the effects of adverse weather. Farm-

ers applied fertilizers to an increased extent. Labor supplies and transportation facilities were adequate.

Acreage for Harvest

Acreage of all crops for harvest in 1949, as estimated on August 1, was above 353 million, the largest since 1932. Total planted acreage exceeded 366 million acres and was the largest since 1933. Abandonment was 13 million acres—about the average of the past 10 years, though more than in any year since 1943. Much of the increased abandonment was in winter wheat, and most of this abandoned acreage was replanted to spring grains or later crops. Ultimately, farmers were able to exceed by 1 percent the total acreage planned in March. Plantings did not quite reach intentions for barley, soybeans, sorghums, potatoes, dry peas, and peanuts, but exceeded the intentions for corn by nearly 2 million acres and for spring wheat by nearly 1½ million acres. Flax acreage was increased, largely at the expense of barley.

Cotton acreage was increased sharply, whereas acreage of hay and feed crops in the South declined from the previous year. Planted acreages of most other crops were fairly close to the prospective acreages. Acreages planted to potatoes, peanuts, and tobacco were limited by restrictive programs.

Dairy Production, Meat Animals, and Poultry

Production of meat animals and poultry sharply increased in 1949, following a long gradual decline from 1943. In eggs and dairy products the upturn was relatively small; wool and mohair clips continued their downward trends. Nevertheless, the total output of livestock and livestock products in 1949, as estimated toward the end of the year, was about 5 percent more than in 1948. It was about 6 percent less than the peak total of 1943 and was slightly less than in 1944 and 1945, but more than in any other year.

An estimated 45.4 billion pounds liveweight of cattle, hogs, sheep, and poultry was produced—about 2.8 billion pounds more than in 1948, but 6.3 billion pounds less than the record of 1943. Milk production, with fewer milk cows on farms, promised to exceed that of 1948 by nearly 2 percent. This production would be about 3 percent less than the record production of 1945, and less than the output of 1946 and 1947, but more than for any other year. Production per cow was at a record level in nearly every month of 1949.

Farm flocks of laying hens numbered less than in 1948 during the first half of 1949, but were increased in the fall. The rate of laying was higher than in 1948 and well above average. Total egg production was about the same as in the high years 1945 and 1946, but 5 percent below the record year 1944. Production of commercial broilers jumped to nearly one-third above that of any previous year. Production of chickens turned sharply upward after a decline of several years. Turkey production nearly reached the 1945 record. Total output of poultry and poultry products was nearly up to the 1945 record.

DISPOSITION OF 1948–49 UNITED STATES FOOD SUPPLY

Continued large production of food in the United States permitted civilian food consumption per capita in the fiscal year 1948–49 at a level of 10 percent above the prewar (1935–39 average) and at the same time enabled us to export more than 21.8 million tons. This was a record export total. It was almost 15 percent above the previous record of more than 19.3 million tons in 1947–48. Food exports from the United States have attained record levels successively in each of the postwar years.

Food consumption per capita in 1948–49, though well above prewar, was down slightly from levels of the preceding postwar years. The decline was in most food commodities. It reflected on the one hand a reduction in food supplies as compared with the previous year, and on the other hand an increased availability of other goods. Nevertheless, consumers purchased greater quantities than in the previous year of butter, cheese, eggs, and fresh vegetables. In contrast with average prewar (1935–39) consumption, we consumed in 1948–49 more of each type of food, except wheat and corn products, rice, butter, edible fats and oils, potatoes and sweetpotatoes, dry edible beans and peas, sugar, fresh fruits, and peanuts.

On a physical quantity basis civilians in the United States took 82.5 percent of the United States food distributed in the fiscal year 1948–49. Exports, with military shipments for relief-feeding included, accounted on the same basis for 16 percent. The United States military services took 1.1 percent for military personnel stationed at home and abroad, and the noncontiguous territories of the United States received 0.4 percent. Civilians in the United States consumed practically the whole supply of some products. Thus United States civilians received 97.1 percent of the Nation's meats, 85 percent of the edible fats and oils including butter, almost 98 percent of the vegetables, about 98 percent of the eggs, more than 90 percent of the fruits, more than 85 percent of the cheese, and about 85 percent of the condensed and evaporated milk.

As indicated, 1948–49 was the fourth consecutive fiscal year in which the food exports of the United States reached a new high record. Among the chief items were wheat and wheat products (grain equivalent) 13,430,000 long tons, other grains 4,265,000 tons; and milled rice 407,000 tons. All told, the exports of cereal products totaled 18,102 thousand tons. Exports of fats and oils totaled 397,000 long tons as compared with 251,000 tons in 1947–48. Exports of meats were 33,000 long tons compared with 68,000 tons in 1947–48. Exports of dairy products totaled 382,000 long tons against 459,000 in 1947–48. Exports of other foods aggregated 2,925,000 tons.

The record exports of wheat and wheat products (in bushels over 501 million) were almost 10 times the annual average for the prewar period 1935–39; they accounted for more than half the United States distribution of wheat for food in 1948–49. Exports of corn and corn products were more than twice those of the preceding year. They amounted to 2,337 thousand tons and represented nearly 55 percent of the United States distribution of corn for food and feed and seed use

abroad. Exports of barley and malt, of grain sorghums, of oats and oatmeal, and of rye and rye flour totaled 1,928,000 tons, grain equivalent—55 percent above the previous year's level and more than 6 times the prewar average. Exports of rice, about the same as in 1947–48, took almost half the United States distribution of rice for food use and went mainly to Cuba.

In fats and oils the exports were almost 60 percent greater than in 1947–48; they were more than 4 times the prewar average. Exports lower than those of 1947–48 included meat, which fell to about 40 percent below prewar; cheese, canned milk, and dried milk—15 percent below 1947–48 but 20 times above prewar; and fruits, vegetables, dry edible beans and peas, soybeans, and peanuts—lower in the aggregate than in the 3 preceding fiscal years.

Destinations of the Exports

Most of the food exports from the United States in 1948–49 went to countries included in the European Recovery Program. These countries received a total of 13,779 thousand tons, or 63.3 percent of our total food exports. Other European countries received 0.4 percent; Far Eastern countries received 19.1 percent; Canada and Newfoundland received 4.0 percent; Latin American Republics, 9.3 percent; other areas, 3.9 percent.

The bizone or United States-United Kingdom area of Germany received more of the foods exported from the United States than any other country. Germany received the largest quantity of wheat and wheat products (3,409,000 tons), other grains and grain products (1,471,000 tons) and "other foods"—most of which were potatoes and potato products such as starch and flour—(1,217,000 tons). For fats and oils this area ranked second (71,000 tons), and meats third (4,000 tons). Relatively small quantities of dairy products and only a very minor quantity of rice were shipped there.

The Far East area under United States military control (i. e., Japan, Korea,[1] and the Ryuku Islands) was the second largest recipient of our food exports. The bulk of the shipments consisted of wheat and wheat products (1,722,000 tons), other grains and grain products (568,000 tons), and "other foods"—most of which were soybeans—(157,000 tons).

The Latin American Republics received the third largest quantity of food exported by the United States—2,035,000 tons. This total was comprised principally of wheat and wheat products (1,254,000 tons), rice (227,000 tons) and "other foods" (255,000 tons). This area received more than 55 percent of the total rice exported from the United States during the period, most of which went to Cuba.

Other areas which received large quantities of food from this country in 1948–49 were Italy (1,878,000 tons), Austria (891,000 tons), Canada and Newfoundland (875,000 tons), France and French North Africa (827,000 tons), and the Netherlands (807,000 tons).

Since the end of the war in 1945 exports of food financed by United States military agencies for civilian feeding in occupied areas abroad

[1] Korea was under United States military control until December 1948. In January 1949, Korea began to receive financial assistance through the Economic Cooperation Administration.

have been large. In 1948–49 these shipments represented more than 28 percent of the total food exports from the United States, the same relationship as in the preceding year, but larger than during 1945–46 and 1946–47.

Currency Devaluations of 1949

Currency devaluations announced recently by many governments will influence the exports and imports of the United States. That is their chief purpose. Following Great Britain's announcement on September 19, that the pound sterling would be devalued 30.5 percent in terms of the United States dollar, most of the other sterling countries announced comparable devaluations. Eighteen additional countries devalued their currencies, among them the Dominion of Canada, which devalued its dollar 9 percent. To foresee the effect exactly or even approximately on the international commerce of the United States is not possible. Too many other influences will simultaneously affect world prices and world shipments.

Ordinarily, currency devaluations in relation to the United States dollar create a downward pressure on the dollar prices of goods and services internationally exchanged, and an upward pressure on prices in the devalued currencies. This is a short-run development. Long-run effects, after the countries involved have achieved complex internal readjustments, may be different. Even in the short-run, the impact on particular goods and prices may vary greatly. Price changes may range between the extremes, on the one hand, of a drop in the dollar price to the full extent of the currency devaluation, with no change whatever in the foreign price; and on the other hand, of no change in the dollar price, with a rise in the foreign price proportionate to the devaluation. Usually, the readjustment will fall between these extremes. In most cases dollar prices will drop by less than the percentage change in foreign currencies. Occasionally, the dollar price may change little.

Possible Impact on United States World Trade

Attempts to estimate the probable impact on United States farm export trade must allow for several obvious facts. In the first place, we must bear in mind that in 1948 the countries that have devalued their currencies took no less than 70 percent of our agricultural exports. Among these exports the most important items were wheat, cotton, and tobacco. In the second place, it is to be expected that the price adjustments for wheat, cotton, and tobacco, to the extent that these adjustments are effects of the devaluations, will take the form largely of an increase in prices in the devaluing areas. Prices of these commodities in the United States are close to the support-levels, and will not be reduced significantly. Finally, attempts to estimate what decrease the devaluations will cause in United States farm exports must allow for the partially offsetting ECA program.

With our principal farm exports largely financed currently by ECA and with their United States prices prevented by price supports from falling significantly, the value of foreign takings will not decline much in the near future. Indeed, the export outlook for raw cotton may

improve. British and other foreign countries may increase their cotton textile exports to the United States, and to other foreign markets. This may increase their takings of United States raw cotton. But United States mills may use less raw cotton. Hence, devaluation may not affect world use of United States raw cotton very much, though it may cause an increase in the proportion used abroad.

Many Nations Agree To Reduce Tariffs

Under the Trade Agreements Program, the United States and other countries took further steps in 1949 toward the reduction of barriers to international trade. At an international meeting held at Annecy, France, 10 additional countries completed negotiations looking toward signing the General Agreement on Tariffs and Trade which 23 nations had signed in 1947 at Geneva. In negotiations with these 10 countries the United States reduced or guaranteed not to raise its customs duties on a number of products both agricultural and nonagricultural. In return the 10 countries granted duty concessions to the United States on products of interest to this country. The reciprocal concessions, like those agreed on by the 23 nations that had adhered in 1947 to the General Agreement on Tariffs and Trade, apply without discrimination to all the participating countries—the 10 concerned in the Annecy negotiations and the 23 signed up previously.

Progress under the Trade Agreements Program, and under policies developed in the related proposals for an International Trade Organization, is important to American agriculture. Our farmers need world outlets for cotton, tobacco, wheat, fruits, and other items. In a world dominated by government controls of trade, self-sufficiency aims, and bilateral or barter arrangements, sufficient outlets cannot be obtained. Trade controls and restrictions have hampered international commerce increasingly in recent years. It is the purpose of the Trade Agreements Program to encourage the opposite principle—that of nondiscriminatory world trade. The agreements negotiated at Geneva in 1947 and at Annecy in 1949 leave much to be accomplished, but they point in the right direction and should bring substantially good results.

PRICE-SUPPORT OPERATIONS

During the 1948 crop season, the Department was required by law to support prices of 19 major agricultural commodities. Most of the price support operations it conducted in this period related to these mandatory commodities. The mandatory support items consisted of 12 Steagall commodities (hogs, milk and butterfat, eggs, turkeys, chickens—3½ pounds and over—live weight, potatoes, sweetpotatoes, certain varieties of dry edible beans, certain varieties of dry edible peas, soybeans for oil, flaxseed for oil, and American Egyptian cotton); 6 basic commodities (corn, wheat, cotton, tobacco, rice, and peanuts); and wool.

As in earlier years, the only methods of support operations that could be used were to remove supplies from the market by means of purchases (used primarily in the case of perishable commodities) and by means of loans or purchase agreements (in the case of most storable

commodities). After these commodities were removed from the market, it was then necessary to seek outlets in which stocks thus acquired could be moved compatibly with the price-support program. The level at which support was required by law was 90 percent of parity on all commodities except cotton and 92½ percent of parity in the case of cotton. Responsibility for conducting these operations lay in the Commodity Credit Corporation.

Price support operations in the 1948–49 season represented part of the concluding phase of wartime price stabilization for agricultural commodities. They aimed at preventing a repetition of the "boom and bust" which occurred after World War I in agricultural prices.

To understand the operations of 1948–49, we must recall the wartime price-support program. Acting under the well-known Steagall Amendment, the Secretary of Agriculture requested farmers in the war years to increase the production of certain commodities and assured them they would receive protection on these commodities during postwar readjustment to a peacetime basis. Simultaneously, during the war years consumers received protection from exorbitant food prices.

Current Phase in Price Support

The phase we are now in relates to the establishment of a price floor under the commodities concerned, pending readjustments in production. This is in line with the commitment made when expansion was requested. Originally scheduled to end 2 years after the termination of hostilities, the commitment was extended by law through the 1949 crop year.

Actual operations to fulfill the Department's wartime obligation to support certain agricultural prices, though in force for a number of years prior to the 1948 crop year, were limited at first to a few commodities. This was true for a while even after the war had ended. Support activity up to the 1948 crops was confined mainly to perishables, such as eggs, the need for which had fallen off after the war and had not been replaced by foreign relief needs. Prices for most other mandatory price support commodities remained well above support levels, owing either to high domestic demand, to large export requirements for foreign relief and rehabilitation programs, or to a combination of both.

In the 1948 crop year, however, unusually high yields and a record output of farm commodities changed the supply picture. These large supplies came at a time when European agricultural production gradually was being restored. Exports of a number of commodities, though still very high, were not large enough to move excesses consequent upon the record production plus a decline in domestic demand. As a consequence, farm prices declined sharply when the 1948 crops started moving to the markets. Extensive price support operations on these crops were, therefore, necessary.

The gross volume of price protection given to producers in the 1948 crop year was almost 3½ billion dollars, the largest annual volume in the history of the Commodity Credit Corporation. This was the total value of the loans made, gross purchase agreements negotiated, and purchases of commodities not under purchase agreement. As gross expenditures, this figure includes the value of loans redeemed and the

value of purchase agreements on which no deliveries were made by producers, as well as the total value of commodities acquired. It thus is considerably different from what the net cost to the Government will be after the disposition of all commodities acquired.

Loans represented the major method of price support on 1948 crops. They amounted to approximately 2.2 billion dollars (mainly on cotton, wheat, and corn). The gross value of purchase agreements negotiated with producers totaled 622 million dollars (chiefly corn and wheat). Purchases outside purchase agreements represented an additional 648 million dollars (principally of potatoes, flaxseed, linseed oil, and peanuts). Over two-thirds of the entire volume of price protection on 1948 crops was in three commodities—cotton, wheat, and corn (cotton, 822 million dollars; wheat, 750 million dollars; and corn, 767 million dollars). In addition, the Department provided substantial protection to prices of other commodities, such as potatoes, 225 million dollars; flaxseed, 228 million dollars; peanuts, 170 million dollars; and tobacco, 102 million dollars, and a sizable amount of protection on all the other 19 mandatory commodities, with the exception of hogs, chickens, and turkeys. Price-support operations also were conducted on nonmandatory commodities, but the volume was relatively small compared with that given to the mandatory commodities.

Coverage and Expense Involved

The importance of the price supports appears in the proportions of major crops covered by CCC loans or purchases. In the 1948 crop year the CCC directly supported 79 percent of the total flaxseed crop, 70 percent of the peanut crop, 40 percent of the dry edible bean production, 38 percent of the potatoes produced, 35 percent of the cotton, 32 percent of the grain sorghums, 29 percent of the wheat, and 15 percent of the corn. In most of these cases the crop proportion covered by CCC price-support action was larger than in any previous year. As of June 30, 1949, the Government's investment in price-support commodities amounted to nearly 2.4 billion dollars. Slightly more than half this sum represented commodities on which loans were still outstanding; the remainder represented commodities in the CCC inventory.

Total cost to the Government of price-support operations under the 1948 crop program has not yet been determined. Net realized loss through June 30, 1949, amounted to 255 million dollars. Most of this loss, specifically 204 million dollars, was on potatoes, a perishable commodity which must be disposed of quickly. It is not possible as yet to know the total costs of all 1948-crop year commodities covered by the price-supports because the Government holds more than 1 billion dollars in storable commodities, the disposition of which is still to be arranged. Some of the 1948 loans, such as those on tobacco and corn, have not yet matured; moreover, some 1948 grain under loans has been resealed for another year.

Price-support operations are expected to continue relatively large during the 1949 crop year, the concluding year of the wartime price-support programs. Under the Agricultural Act of 1948, the Department must, in the 1949 crop year, continue to support prices of the Steagall commodities, the basic commodities, and wool—the same

commodities on which support was mandatory in the 1948 crop year. Output of farm commodities in 1949 may be second only to the 1948 record. Carry-overs from the 1948 crop are large and the Government already owns substantial quantities of major commodities. Export demand has fallen off from the record levels of recent years and some weakening has occurred in demand at home.

Need for Continued Support Action

The price situation during the early part of the 1949 crop year pointed to the probable need for active price support on nearly all the mandatory price-support commodities. Prices of many mandatory price-support commodities were pressing down on 1949 crop-support levels and prices of nearly all the others were not far above the support levels. In mid-August, prices of farm commodities as a group were averaging closer to the parity level than at any time since our entry into World War II. Corn, wheat, and cotton were the three farm commodities that required the largest amount of support during the 1948 crop season. At the beginning of the 1949 crop year, prices of corn and wheat were at or below support levels and cotton was only slightly above the support level. Oilseeds required the next largest amount of price-support assistance in 1948–49. Prices of peanuts and flaxseed at the start of the 1949 season were down to support levels and soybeans were only moderately above the support level.

During the first half of the 1949 season, it was necessary to buy butter and nonfat milk solids to support prices of butterfat and manufacturing milk and these purchases are continuing in the second half of the season. Purchases of sizable amounts of dried eggs have been necessary to support egg prices. Prices of lower grade potatoes from the 1949 crop have declined to levels which have necessitated some support operations even though the 1949 crop level of support is only 60 percent of parity compared with 90 percent for 1948 crop potatoes. No actual price-support operations have been required on 1949 crop turkeys, chickens, and hogs—the only farm commodities where no price-support operations were required in the 1948 season—because prices of chickens and turkeys were still slightly above and hogs considerably above support levels. Before the end of the 1949 season active support operations may be necessary on each of these perishable products.

Problems Ahead in Price-Support

The type of price-support problems that lie ahead in 1949–50 can be judged from the fact that the Department already has had difficulty in disposing of commodities acquired under the 1948 crop price-support programs. Disposition of 1948 crop stocks at a time when substantial additional quantities of 1949 crop commodities are coming into inventory undoubtedly will aggravate the already difficult disposal problem, mainly on perishable commodities. This disposal problem points to the need of supplementary action on price-support, particularly with respect to more efficient methods than purchases for handling price-supports of perishable commodities.

One of the major problems ahead in 1949–50 is that for the first time we may have to support prices of hogs on a large scale. We lack effective practical measures for supporting hog prices. With hog prices much below support levels, the Government would have to purchase either live hogs or pork products. These would be its only alternatives. Manifestly, the Government would not be able to handle live hogs very well. So, in practice, it would have to buy only pork and pork products. This it would have to undertake under conditions of extreme difficulty, such as might not insure the equivalent of support prices for all producers in all parts of the country. Indeed, the Government might find itself supporting prices more effectively for hog packers than for hog producers.

Price-support operations would be difficult for other perishable commodities. Experience with potatoes and with eggs shows that it is much easier to buy than to sell. There have been difficulties in disposing of Government-owned stocks of perishables abroad as well as within the United States. It has been almost impossible to release Government holdings of surplus perishable commodities by making sales in the United States for food uses because such sales at price levels prevailing now would interfere with the price-support programs. As a consequence, our only practical outlets to date have been to export the commodities or to divert them into nonfood uses. Export outlets on perishable commodities have been extremely limited even at the prices at which we are permitted by law to sell. This has made it necessary to do as we did in the case of potatoes—divert products largely into nonfood uses in order to prevent waste and spoilage.

Main Shortcoming of Present System

The fundamental trouble with the price-support machinery we have at present for perishables and semiperishables can be stated very simply. Currently, our purchase price-support programs encourage over-production on the one hand and under-consumption on the other. Once we acquire these commodities, the Government must either convert the excess production into storable form, where possible, move the commodities into export outlets at reduced prices, divert them into nonfood use, or destroy the commodities if no outlets of disposition are available. To find sufficiently new uses for the surpluses, or to divert them into noncommercial channels at anything comparable to the support price is usually impossible. Even on a scale relatively small, such as we have seen with potatoes and a few other commodities, the direct purchase or loan procedure presents difficulties. On a big scale for the perishable crops and livestock it would not work for long.

Although there have been problems during the postwar readjustment period in conducting price-support operations, these problems must not deter us from continuing price-support as an integral part of our farm program. During wartime, price-support programs were instrumental in boosting food supplies to record levels. During peacetime, they can help to provide the realistic sustained abundance of agricultural commodities that all of us desire. The question that confronts us is not whether or not there should be a price-support program.

The American people already have decided that farmers should have adequate incomes. Until a better method is developed, price support is the best method of keeping farm purchasing power from falling below the levels at which the public interest requires farm income to be maintained. Our problem today is to develop methods of price support which will give farmers this income protection and at the same time efficiently serve the farmer and his family; not discriminate unfairly against any group in our economy; operate efficiently with costs commensurate with the benefits to the Nation; and serve the general policy objectives of the Nation.

As the Nation's economy grows it will be able to absorb an increased agricultural output, provided agriculture makes certain changes in the types and quantities of its production. To help it do so, we must alter our price-support policy. Specifically, we need an additional method of supporting agricultural prices. Existing methods depend chiefly on Government purchases and loans, which cannot satisfactorily support the prices of perishable products. Yet perishable products are those in which expanded production is most desirable. Moreover, some perishables are major sources of farm income. To be fully effective, the price-support program should provide as definitely for them as for important storable commodities. Accordingly, I have urged, and I continue to urge, congressional authorization of support through production payments for perishable agricultural products.

Agriculture has other important needs. For example, the lower-income groups in agriculture need special credit, management-aids, and means of improving and enlarging their farms. Many farmers need further rural electrification, improved housing, and improvement and expansion of rural health facilities. The Government is actively promoting these ends.

Nevertheless, the most general interest of the farmers centers in *price policy*. This is of major importance to most farmers; it is important even to the farmers whose production for the market is not large. Our agricultural price policy is in urgent need of improvement along the lines I have mentioned. With special means of supporting the prices of perishable products, the farmers will be better able to meet changing peacetime needs.

Sound Price-Support Program Indispensable

We all want a prosperous country and if we are to keep our Nation properous, we must have a sound price-support program. Agriculture is a basic segment of our economy, and a healthy agriculture means a healthy economy. Price support can help to keep our Nation properous in a number of ways. It can help to prevent depressions. Most depressions have been farm led and farm fed. It can help to build markets for industrial goods and help to maintain employment for labor. Industry today is dependent on the farm market to a far greater degree than it has ever been. It can help to encourage a high level of production with the greatest assurance of reasonable prices to consumers. Stable farm prices and incomes achieved these goals in wartime and can help to achieve them in peacetime. It can help to maintain agricultural resources. A program that maintains farm income encourages conservation. It can help to protect

our national security. We need a reservoir of goods to protect the Nation against crop failure and to assure supplies for an even flow of trade. It can help to stabilize the rural community and maintain individual opportunity in our free enterprise system.

Although price support will cost money, these costs should not deter us from continuing to have price support. When the wartime price-support program was inaugurated some years ago, we knew that this program would cost money during the postwar readjustment period. However, we also recognized that this risk had to be taken in order to obtain the food supplies needed to win the war and to save the peace, and at the same time to give farmers the same price protection given to industry in the form of contract terminations. Certainly the costs of carrying out these wartime commitments have been quite reasonable—far lower than anyone estimated at the time.

Past costs have been lower than generally known and future costs are likely to be lower than generally stated. Too little attention has been paid to the fact that in the first 15 years of its operation, through June 30, 1948, the Commodity Credit Corporation, which finances the Department's price-support programs, operated on a break-even basis for programs other than the wartime consumer subsidy programs. Too little attention also is paid to the fact that the benefits from price-support programs are not measurable solely in terms of dollars and cents and that any program which effectively contributes toward the aim we are seeking is worth a considerable public investment. For each year of the price-support program we may not be able to set up a balance sheet in terms of dollars and cents and balance the costs with benefits. It is important to remember also that it is much less costly to take steps to help prevent a depression than it is to take action to bring back prosperity once we have entered into a depression.

POTATO PRICE SUPPORT

Price-support operations continued on a large scale with potatoes. It had been estimated in July 1948 that the 1948 crop would be only 391.8 million bushels. But the final estimate was 445.9 million bushels, an output second only to the 484.2 million bushels produced in 1946. In surplus over domestic needs, it was a record, and involved difficult surplus-disposal operations.

This large production came from a planted acreage 26.6 percent smaller than the 10-year average and 27.6 percent smaller than the average during the war years. Yield per acre was a new high—slightly more than 212 bushels, or nearly twice the average yield in the years 1919–28, the potato-parity base period. Through price-support operations this Department had to remove 133.6 million bushels from the market.

It had been expected that about 375 million bushels could be marketed at the support level of 90 percent of parity. This would have left a surplus of only about 71 million bushels above domestic needs. Actually, as stated, the Department had to purchase 133.6 million bushels. About 9.3 million bushels had entered the United States from Canada, attracted by our high prices. Hence the above-mentioned purchase figure may be adjusted to 124.3 million bushels of domestically produced potatoes.

Partly, the surplus problem reflects declining consumption. Per capita consumption of potatoes in the United States has been declining for more than half a century at an average rate of nearly 1 percent a year. In recent years the rate of decline has jumped to about double the long-time rate; consumption is down now to about 108 pounds, as compared with 151 pounds 30 years ago. Growth of population, formerly sufficient to keep the total demand fairly steady, no longer offsets the decline in the per capita consumption.

Price-support operations for 1948 potatoes began in March of that year and continued through June of 1949. The surplus disposal was complete; that is to say, it involved no waste. Prevention of waste, however, proved extremely costly. Gross total cost of the 133.6 million bushels of 1948-crop potatoes purchased by the Department in the price-support program was $1.78 a bushel. This included $1.49 for the commodity and 29 cents for freight, storage, and handling. The net outlay, or the expense after allowing for the money recovered through disposal operations, was about $224,000,000. How the Department disposed of the surplus potatoes without wasting any of them appears in the following table:

	Million bushels		*Million bushels*
Direct distribution	4.6	Flour	33.2
Livestock feed	38.0	Dehydration for export	1.0
Institutions	.2	Demonstration	.9
Export, fresh	.6		
Alcohol	44.8	Total	133.6
Starch	10.3		

Plans for 1949 Crop Potatoes

Early in 1949 the Department announced its plans for 1949 crop potatoes. The Agricultural Act of 1948 gave the Department authority to support prices of potatoes in 1949 on a flexible basis. In line with this authority it fixed the support for the 1949 crop at the minimum level—namely, 60 percent of parity. Plantings were smaller by about 10 percent than in 1948. Moreover, the weather was unfavorable for potatoes in important producing areas during 1949. Accordingly, by comparison with that of recent years, the production was not very large. Nevertheless, it was estimated as of August 1 that the yield per acre would be the second highest on record, and that the total crop would be 362.5 million bushels. This total exceeds the estimated maximum consumption needs by 12.5 million bushels. It is about 40 million bushels above the average quantity utilized (after surplus-removal operations) in the years 1946–48. Price-support activity will consequently have to be continued for 1949 potatoes, though on a smaller scale than in previous years and probably with lower unit costs and lower total costs.

An innovation deserves notice. Earlier programs tended to give the Department a disproportionately large share and consumers a correspondingly small share of the good-quality potatoes. Support-price schedules differentiated between the better and poorer grades. Commercial markets sometimes offered less than support prices for the good grades, which thereupon went to the Department, and more than support prices for the low grades, which thereupon went to consumers.

Support prices under the 1949 program are alike for all grades above culls. This creates an incentive to market only the best-quality potatoes, because the commercial market is the only place where more can be had for one grade than for another. This feature of the program is effective. As of June 30, 1948, purchases by the Department from the 1948 crop averaged 84.4 percent U. S. No. 1 grade and better. By contrast, as of June 30, 1949, the superior grades accounted for only 6.7 percent of the Department's total purchases.

Marketing Agreements

Marketing agreements and orders represent a significant quality development. These programs form a basis for regulating the qualities and sizes of potatoes sent to commercial markets. They remove from market channels the low grades and small sizes which tend to depress prices to an extent out of proportion to their volume. Consumers consequently get the superior-quality potatoes. Programs already were in effect in Michigan, Wisconsin, Minnesota, North Dakota, South Dakota, Idaho, and Malheur County, Oreg.; Colorado, the Klamath Basin area of Oregon and California, and the commercial sections of North Carolina and Virginia. In addition, a new program became operative in Maine last November. Washington and New Jersey have programs formally under consideration and other sections are moving toward formal consideration.

FARM PRICES AND EARNINGS

Cash receipts from farming in 1949 may be about 10 percent below those of 1948. This is shown by the receipts during the first 8 months. Costs of farm production will drop proportionately less. Consequently, the farmers' net income for the year will show a decline of more than 10 percent from the level of 1948, with a partial offset in the shape of lower rural living costs.

In 1948 the cash receipts from farming, and also the prices received by farmers, attained record high levels. The cash receipts were 30.5 billion dollars—almost four times the prewar average. Prices received by farmers in 1948 averaged almost three times the prewar average. But 1948 was a year in which farm costs rose more than farm receipts, with the result that 1948 was the first year in 10 years to bring a decline in the realized net income of farm operators.

Probably the reduction during 1949 as compared with that of the previous year will be larger, because the prices of agricultural commodities have dropped sharply from a year ago mostly as a reaction to 1948's record crops. (By August 1949, prices received by farmers were 15 percent below the 1948 average.) Agriculture's share in the national income was running slightly smaller in 1949 than in 1948. This share in 1948 was 10 percent, the level maintained with approximate stability since the end of the war. It may be compared with the 8.9 percent earned by agriculture in 1939. In estimating the significance of this percentage, it must be remembered that almost one-fifth of the Nation's population lives on farms, and that about one-eighth of the Nation's working force is engaged in farm work.

Consumption of food per capita in the United States was main-

tained at 10 percent above prewar, despite large exports of food. Both production and consumption of food in the United States were about the same as in 1948. Consumption was higher than during the previous year in pork and the better grades of beef and likewise in most dairy products and in poultry and fresh fruits other than citrus; it was lower in the lower grades of beef, and in veal, lamb, and mutton; it was lower also in fresh citrus fruits and fresh vegetables.

Expenditures by consumers and by business concerns for inventory declined during the year, with a partial offset in increasing governmental outlays. These cross trends were in contrast with those of recent years, when private expenditures increased while Government expenditures declined. It seemed that the preceding years of high-level production and advancing prices had virtually eliminated deferred demands for most types of consumer goods, and left a weaker demand. Consumer expenditures in the first half of 1949 declined from the record level established in the last half of 1948.

Changing Export-Import Balance

Exports of goods and services from the United States in the first half of 1949 were somewhat above those of the comparable period in 1948. The 1948 total, however, was far below the 1947 peak. Exports of goods and services in 1948 totaled 16.8 billion dollars, as compared with 19.7 billions in the preceding year. Agricultural exports in 1948 totaled about 3.5 billion dollars—8.8 percent less than in 1947; farm exports declined in most commodity groups, with cotton an exception. Tobacco exports dropped 21 percent, primarily because of reduced takings in the United Kingdom and the Netherlands; exports of wheat and flour remained about unchanged; all grain exports declined a little, mainly because of reduced shipments of corn; exports of fats and oils, eggs, and dairy products were lower in 1948 than in 1947. Though slightly higher in the first half of 1949 than in the first half of 1948, total United States exports of goods and services for the entire year 1949 may not differ much from those of the previous year.

Naturally, this will affect the economy of the United States. Moreover, we cannot guess what the effect will be just by noting the trend in the exports. We have to consider also the imports. The two trends together, with associated movements of money and credit, make up our international balance of payments. It is not essential here to consider all the elements of this complicated pattern; the main facts will suffice. In 1948 the imports of the United States rose almost as much as its exports of goods and services declined. Specifically, the imports rose by 2 billion dollars, while the exports dropped by 2.9 billion dollars. In other words, the export surplus, or the excess of exports over imports, declined from 11.2 billion dollars in 1947 to 6.3 billion dollars in 1948. This change in our trade balance was basically favorable for the United States; it was partly what our postwar world policy had been aiming to bring about. It showed progress in our effort in cooperation with foreign countries to promote economic reconstruction abroad and testified also to the high economic activity and consumer buying-power of the United States. The rise in our imports was an evidence of our prosperity. Nevertheless, the changing balance between exports and imports posed problems for many Americans, particularly for United States farmers.

Trends in Prices

Wholesale price trends reflected the decline in economic activity. Wholesale prices of all commodities, as represented by the Bureau of Labor Statistics index, reached their peak in August of 1948; by August 30, 1949, they had declined 10.3 percent. As usual in recessions, products of agricultural origin led the decline. Wholesale prices of farm products and foods in the BLS index declined much more than "commodities other than farm products and foods." By August 15, 1949, the wholesale prices of all farm products were down 20 percent from the postwar high of January 1948. Wholesale prices of foods were 16 percent lower than their peak in the summer of 1948. By the same date the group of commodities "other than farm products and foods," which consists chiefly of industrial commodities, was down less than 6 percent from its postwar high—reached in that case in November 1948.

Following the large harvests of 1948, agricultural prices at the farm showed sharp reductions in some cases. In food grains, in feed grains and hay, and in oil-bearing crops, the peak prices after the war were those of January 1948. By August 15, 1949, food grains had dropped 37 percent, feed grains and hay 48 percent, and oil-bearing crops 41 percent. Cotton by the same date was down 17 percent from the postwar peak; in cotton the peak period was May and June of 1948. Livestock and livestock products reached their high points in the summer of 1948. By August 15, 1949, meat animals were down 24 percent from their peak, dairy products about 22 percent, poultry and eggs 9 percent. Crops and livestock items combined were down 20 percent from the postwar high.

In retail prices the average decline was small, and mainly reflected lower prices for food and other farm products. From a peak reached in August of 1948, the BLS index of urban consumer prices was down only 3 percent by July 1949.

These price and supply developments have obliged the Department to ask for reductions in the acreages of some crops. With just average weather conditions, and even with acreages considerably reduced from 1949, the production of agricultural commodities in 1950 will still be large. Productivity per acre and per animal is constantly increasing; and this technical progress tends to offset acreage reductions. Meantime, continued readjustments in domestic industry may push consumer demand down further. Foreign outlets for United States farm products will largely reflect decisions by the Congress as to aid-programs, although the gradual recovery of foreign agriculture will probably continue and will involve some reduction in the foreign demand for American products. Briefly, the outlook includes the likelihood of some further contraction in the total demand for United States farm products, and points to the need for adjustments in production if a favorable price level is to be maintained.

Needed Adjustments in Production

Wheat typifies the position of several commodities. Our wheat production in 1949 was 1,129 million bushels according to the September estimates. The sixth crop in succession to run above 1 billion

bushels, it was the fourth largest on record, although the average yield per acre was the lowest in 10 years. Carry-over was 293 million bushels. Hence the total United States wheat supply at the beginning of the 1949-50 crop year was the fifth largest on record. As noticed elsewhere in this report, our exports of wheat in 1949–50 may not fall much below the 1948–49 record. Hence the carry-over may not increase very much. Foreign takings of United States wheat in 1950–51 may decline. Moreover, yield per acre in 1950 in the United States is likely to be higher than in 1949. Hence, we are likely to be faced with a serious surplus of wheat at the beginning of the 1951–52 crop year unless production is adjusted in line with total demand.

In 1950 we will have acreage allotments for wheat; we shall need them for cotton and peanuts and perhaps also for corn and rice. Our corn crop according to the September estimate was only 125 million bushels below the 1948 record. Carry-over of corn may exceed 1 billion bushels. Hence marketing quotas as well as acreage allotments may be necessary on corn in 1950. Our rice crop is 90 million bushels or almost 50 percent above the 10-year (1938–47) average. This will necessitate rice acreage allotments and possibly marketing quotas for 1950 rice. Similar problems are emerging with regard to other crops, and may eventually cover a wide area and involve a long list of commodities.

Our large production of crops in 1949, along with the high carry-overs from 1948, means that we are likely to have continued high agricultural supplies in 1950. Agricultural output is continuing at somewhat more than one-third above the prewar (1935–39) volume, at which level it has been comparatively stable for 6 years, following its rapid expansion during the war. Crop production in 1949 was below the record level of the previous year, though second only to that. Production of livestock items, however, promised to exceed the 1948 total. All told, the agricultural output for sale and for consumption in the farm home will be about the same as it was in the previous year or about 38 percent above the 1935–39 level.

Sharp Drop in Demand Unlikely

It seems unlikely that we need fear any sharp drop in the demand for American farm products. Many strong forces are contributing to maintain a high level of activity in this country and at the same time to sustain export trade. Foreign needs for American foods and other farm products continue large, despite prospects of a slight decline. Another section of this report gives reasons for believing that foreign countries may take nearly as great a quantity of bread grains from the United States in 1949 as they did in 1948, along with an increased quantity of corn. Our exports of cotton by present indications will be larger than in any year since the war and possibly as much as 50 percent above those of 1948. Altogether our agricultural exports in the calendar year 1949 may amount to 3.7 billion dollars, as compared with 3.4 billions in 1948. Government expenditures will strengthen the market for American agricultural products both at home and abroad. As noted, these expenditures increased greatly in 1948 and will remain high throughout 1949, with State and local government agencies heavily represented in the total. Expenditures

by business concerns for plant and equipment are continuing at a high level, with an obvious beneficial influence on wage payments and on consumer buying power generally. The construction industry is operating at a level only moderately below that of 1948. Altogether, we can count on a comparatively high level of domestic activity and demand during the rest of this year and in early 1950.

Strength of the Supply Forces

Nevertheless, we must not forget the strength of the supply forces in agriculture. Aided by rapid progress in science and invention, agriculture in the United States is continuing its output at close to 40 percent above the prewar level. It is struggling currently with the largest carry-overs in recent years. It feels the impact of a slight reduction in demand at home and the beginning of a significant change in world demand. Production continued at present levels is likely to bring further price reductions unless the demand remains near present levels or improves unexpectedly. Prices of basic crops (wheat, corn, cotton, tobacco, rice, and peanuts) are supported at levels close to those maintained for the 1948 crops. Price support operations are in progress for other crops. The success of these operations, however, presupposes action by farmers to bring their production more nearly into balance with demand. Otherwise, operation of the price supports will be difficult and very costly. With some commodities, such as a number of the perishable products, price supporting action could fail in the absence of production adjustments. Currently, the agricultural situation is still favorable; but it includes warnings we cannot afford to ignore.

FARM SHARE OF FOOD DOLLAR

During the entire period June 1943 through May 1949, there was no month in which farmers received less than 50 cents out of each dollar spent at retail for farm food products included in a typical market basket. In June 1949, however, the farmer's share of the consumer's food dollar dropped to 48 cents. This figure may be compared with 52 cents in June 1948 and the record high of 55 cents in January 1948.

The farmer's share of the consumer's food dollar recently has been relatively high. It is often and in fact usually less than 50 cents. It has been below 50 cents during most of the period covered by the data. Specifically this was so between the two world wars and up to September 1942. The record annual low was that of 1932, when the farmer's share of the food dollar fell to 32 cents. As late as the period 1935–39 the share was less than 40 cents.

Among other variables, the level of retail prices influences the farmer's share of the consumer's food dollar. Farm prices move up and down along with retail food prices, but faster as a rule and more violently. This is because marketing costs and margins, which reflect transportation charges, handling charges, and wage rates, are often fairly stable. For example, the farmer's share in the money spent for the typical market basket increased from 44 to 54 cents between 1941 and 1946. The retail cost of the market basket increased 52 percent in this same period, with farm prices enhanced 83 percent and

marketing charges only 32 percent. In 1948–49, the principle worked the other way. The market basket dropped 7 percent in retail cost. Farm value of the products in the basket dropped 14 percent, while marketing charges involved rose 1 percent.

Naturally, the farmer's share of the consumer's dollar varies among products of agricultural origin. Largely, the variation reflects differences in the transportation, storage, and processing required. These ingredients vary from little to much in cost of the commodity as delivered to the consumer. Thus in June 1949, when, as mentioned, the farmer's share of the consumer's food dollar was 48 cents, the farmers received 65 percent of the retail price paid for good grade beef, 63 percent of the retail price paid for fluid milk, 71 percent for eggs, 37 percent for fresh fruits and vegetables, 21 percent for canned fruits and vegetables, 16 percent for white bread, and 13 percent for corn flakes.

FINANCIAL CONDITIONS OF UNITED STATES FARMERS

The balance sheet prepared for agriculture on January 1, 1949, probably marks the high point of farm asset values for the World War II era. Physical assets such as real estate, crops, livestock, and machinery were valued at about 105 billion dollars. The financial assets, mainly cash, bank deposits, and United States savings bonds, amounted to almost 22 billion. Total assets of approximately 127 billion dollars were 5 percent above those for January 1, 1948, and more than two and a third times the prewar figure for 1940.

These further increases in assets—both physical and financial—resulted from continuing generally prosperous farm conditions during 1948. The total net income of agriculture in 1948 of 22 billion dollars was a slight increase over the record 1947 level. This net income was 38 percent more than in 1945 when the war ended and 246 percent greater than for the prewar year 1940.

Farm incomes and farm prices attained record high levels in 1948. The index of prices received by farmers, with the period 1909–14 taken as equal to 100, was 287 for the full year 1948, as compared with 278 in 1947 and 202 in 1945. Nevertheless, 1948 witnessed the first significant downturn in agricultural prices since before the war. After reaching 301 in July, the index dropped and by December was 268. Moreover, further declines in agricultural prices took place in the first half of 1949.

These price declines have accompanied similar trends in general economic conditions. It now seems probable that rising trends in expenditures, prices, and incomes which were induced throughout the national economy by the inflationary forces of the war ended in 1948. In many segments of the economy there has been an orderly recession from the wartime peaks.

As reported in more detail elsewhere in this report, the value of farm real estate, the major asset in the agricultural industry, has for the first time in 10 years declined significantly. After reaching a high of 177 (1912–14=100) in November 1948 the United States index of average value per acre declined to 175 by March 1949 and on July 1 was 172. The high-water mark of the land boom appears to have ended.

Livestock, another important item in agriculture's balance sheet,

was at a record high of 14.7 billion dollars on January 1, 1949. As numbers were down from a year earlier, this value resulted from high prices. Nevertheless such prices were well below the peaks of mid 1948 and further declines are probable. Heavy purchases of farm machinery during 1948 brought the value of this item on January 1, 1949, to 23 percent above the value at the beginning of 1948. Under the prosperous conditions of 1948 farmers also bought much household equipment to increase this value 11 percent to about 6 billion dollars. Crops stored on and off farms were an important exception to the upward trend in values. Although stocks were larger on January 1, 1949, the drop in prices during 1948 was sufficient to reduce the value below January 1, 1948, by 4 percent.

Financial Assets of Farmers

Financial assets of farmers—cash, bank deposits, United States savings bonds, and cooperative investments—which amounted to only 5 billion in 1940 grew rapidly during the war period and on January 1, 1948, amounted to about 22 billion dollars. These assets represent one of the most important gains by agriculture during recent years. Between 1948 and 1949, however, the volume of the financial assets owned by farm people remained virtually unchanged. Although income remained high it is apparent that larger expenditures were made for improvements, machinery, and family living. Unless farm income increases these assets, especially currency and demand deposits, will probably decline in 1949. But these holdings still remain relatively high and provide much of the financial strength existing in the agricultural economy. The distribution of these assets, however, is not uniform and undoubtedly large numbers of farmers have little or no financial reserves.

Another important influence on the financial condition of agriculture is the debt trend. Farm real-estate debt increased nearly 5 percent during 1948 and at the beginning of 1949 totaled over 5 billion dollars. However, it still remains below the 1940 level and is only 9 percent above the 1946 low. Non-real-estate debt, excluding price support loans, continued its postwar increase during 1948 and on January 1, 1949, was 20 percent above a year earlier and 74 percent above the level on January 1, 1946. With declining farm income this short-term debt will tend to level off and work down to a lower level. Farm real-estate debt will probably continue to increase for the next year or two, especially if there is any great refunding of the short-term loans.

On the whole, the debt situation of agriculture is very favorable. During the past several years the amount of debt distress among farmers has been insignificant. Debt is low relative to prewar conditions and any large amount of foreclosures and forced transfers is not expected unless a severe, sharp drop in farm income occurs. In individual instances, however, debt undoubtedly is excessive and there may be scattered cases of distress.

Price support loans made or guaranteed by the Commodity Credit Corporation rose from only 84 million dollars on January 1, 1948, to over a billion dollars on January 1, 1949. The large crop production forecast for 1949 along with the declining demand indicates further

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expansion in such loans by 1950. However, these are nonrecourse loans and, in the usual sense, are not considered to be farm liabilities.

Briefly, the agricultural industry as a whole in 1949 was in strong financial condition. It had relatively small fixed financial charges and its net income, despite recent declines, remained high. Financial reserves in the aggregate were large and debt was relatively low. In general, the financial position of agriculture was such that, if necessary, it would be able to withstand a substantial shrinkage of farm income without suffering serious difficulties.

LAND VALUES TURN THE PEAK

The steady 10-year rise in farm real-estate values that accompanied World War II appears to have ended in most parts of the country. The United States index reached a high point of 177 (1912–14=100) in November 1948, 4 percent above the 1920 peak and 113 percent above 1935–39. By March 1949, however, the national index was 1 percent below November. Declines in most of the Mountain and Pacific Coast States, caused in part by lower livestock prices and the severe winter, were sufficient to more than offset the general but limited increases that occurred elsewhere.

Further indication that the high-water mark in the postwar land boom was reached during the winter and spring of 1948–49 is afforded by the widespread declines that occurred between March and July 1949. Although the declines were generally small, in about half the States they were the first in more than 10 years. In about a fourth of the States, the July 1949 index showed a drop for the second consecutive period. All but seven States now show some decline from their recent peak. The largest declines have occurred in California and Florida, where values reached a peak in March 1947. The total decline shown for these States is now 12 and 11 percent, respectively. The national index for July was 2 percent below March, 3 percent below last November, and 1 percent below July 1948.

The weakness apparent in the farm real-estate market in recent months is largely a reflection of the declines in prices of farm products since mid-1948 and the less favorable expectations for net farm income in 1949. These factors, together with the easing tendencies in the general economy that became apparent during mid-1949 in lower rates of production in certain industries and increased unemployment in some areas, have reduced the effective demand for farm land at prevailing asking prices.

Prospective buyers have shown increased caution and many have adopted a "wait and see" policy. As a result, the number of farms sold has declined for the last 2 years. About 17 percent fewer farms changed hands during the year ending last March than during the previous year and about 29 percent fewer than during the peak year of 1946–47. Despite this sharp decline, however, farms are still being sold at a rate of about 50 percent higher than in 1935–39. The number of farm foreclosures and forced sales continues at the record low levels of recent years.

Financing has not seriously limited farm purchases in most areas. Although some lenders have become less willing to finance buyers with small down payments and interest rates have increased slightly, most

buyers have been able to obtain adequate financing. The bulk of the new mortgage credit has been supplied by individuals, in many cases the sellers of the property, and commercial banks. Many of these mortgages have been for short periods and will require refinancing.

Demand for Credit Financing

Available data indicate that a higher proportion of the farms bought during 1948–49 required credit financing than in previous years. Although real-estate mortgages are the most commonly used method of financing, the use of purchase contracts has increased in importance in the Mountain and Pacific Coast States and they are used to some extent also in the Great Plains States. Down payments on mortgage-financed transfers have averaged about two-fifths of the purchase price and no significant trend is apparent.

About a fifth of the credit buyers, however, have incurred mortgage debts of 75 percent or more of the purchase price. The owners in this group are likely to be among the first to feel a squeeze between high fixed costs and declining net income. In spite of the large volume of farm land that has changed hands during and since the war, however, the over-all mortgage-debt picture remains generally favorable. Some financial distress attributable to the wartime inflation of land may occur, but in extent and severity it is likely to be much less than that which followed World War I.

The uncertain long-term outlook for farm earnings has probably been more effective in checking the rise in land values than has the relatively small decline in farm income that has occurred thus far. Farm land is still yielding a current rate of return of nearly twice the farm mortgage interest rate. The value of gross rents in 1948 was only about 3 percent less than in 1947, but higher ownership costs, especially taxes and building maintenance, reduced the net rents about 10 percent. But current net land returns still remain high in relation to returns from other comparable investments. Under these conditions, present owners, especially in the better farming areas, have not been inclined to put their land on the market or to accept lower prices for their property. Although land values may continue to work toward a lower level, it appears that no sharp break is likely in the near future.

FARM CREDIT UNDER FEDERAL SUPERVISION

Credit institutions supervised by the Farm Credit Administration help farmers and ranchers to improve their incomes and living conditions. This is accomplished by providing sound credit to them, and to their marketing, purchasing, and business service cooperatives. On December 31, 1948, the various units had on their books more than 544,000 loans to individual farmers and farm cooperatives totaling approximately 1.7 billion dollars.

The Farm Credit Administration maintains 12 district offices in addition to the Washington office. Each of these comprises a Federal land bank, a Federal intermediate credit bank, a production credit corporation, and a bank for cooperatives. There is also a central bank for cooperatives in Washington.

Oldest of these institutions are the 12 Federal land banks. These with the approximately 1,200 national farm-loan associations make up the completely farmer-owned Federal land-bank system. In most areas there is a national farm-loan association within reasonable distance of every farm and ranch. Through these local farm-mortgage cooperatives, amortized, long-term Federal land bank loans are obtained by individual farmers and ranchers. Mortgage loans may be made for farm improvement, soil conservation, farm land purchase, the refinancing of existing farm mortgages, and similar purposes. Payments are scheduled for periods when the borrower will have income from the sale of agricultural products. The amortized principle is credited by many thousands of farmers with making it possible for them to reach debt-free farm land ownership.

The 12 Federal intermediate credit banks are banks of discount which make available short-term and intermediate-term lending funds to the production credit associations, and to the banks for cooperatives. Various other eligible types of farm-financing institutions and farmer cooperatives likewise obtain funds for lending through these banks.

The 12 production credit corporations supervise the operations of 503 local short-term credit cooperatives known as production credit associations. These associations with 450,000 farmer members serve every agricultural county in the United States and Puerto Rico. They make credit available on a sound basis for all types of farm production purposes. Through increasing farmer-owned capital and reserves their membership is making considerable progress toward the goal, already reached in the Federal land bank system, of complete farmer-ownership. Fifty-six production credit associations have returned all Government capital. It is confidently expected that by the end of 1949 approximately 100 will have reached the objective of becoming entirely the property of the farmers who obtain their short-term credit through them. Many of the others are moving rapidly toward farmer-ownership.

Most direct contact of farmers and ranchers with the Farm Credit Administration is as members of the cooperative national farm-loan associations and production credit associations. A farmer who obtains a land-bank loan becomes a member of his national farm-loan association with full voting privileges. In like fashion, the farmer who gets short-term credit for farm production and related purposes—including home modernization and remodeling—through a production credit association, becomes a voting member of that short-term credit cooperative.

The strength of United States agriculture is increased by the financial stability and efficiency of farmers' cooperatives. At least half of our farmers are members of one or more such marketing or purchasing associations. Farmers and ranchers who are members of such cooperatives are benefited by business loans made by the banks for cooperatives to their associations.

Farm Cooperatives Aided

More than 10,000 cooperatives market farm products; some of them manufacture and distribute production supplies. Total volume of business done by farmers' cooperative associations in the 1947–48

season was more than 8.6 billion dollars. As of January 1, 1949, farmers' equities in marketing and purchasing cooperatives were estimated at 1.01 billion dollars.

Declining prices for many farm products created difficulties for some cooperatives during 1949. Inventory and credit problems became more acute, while buyers' resistance increased. Notwithstanding these difficulties it is to the credit of most farmer cooperatives that they weathered the storm and continued to make progress. Some of them constructed up-to-date processing and storage plants, increased their efforts to consolidate sales, and strengthen their representation in terminal markets. More cooperatives took active interest in technical and economic research, and studied how to apply the results. Various attempts to discredit farmers' cooperatives motivated more cooperatives to support programs to inform the public about their aims and operations.

As authorized by the Cooperative Marketing Act of 1926, the Farm Credit Administration extended research, service, and educational assistance to farmers' cooperatives, through its Cooperative Research and Service Division. This unit issued publications that proved useful to cooperatives, to students in colleges and high schools, and to officials and other representatives of foreign governments who sought information about agricultural cooperation in the United States. Requests from foreign countries for information of this kind were much greater than in prewar years.

AGRICULTURAL COLLABORATION WITH FOREIGN COUNTRIES

Our agricultural cooperation with foreign countries is expanding. It was broadened by the United States Information and Exchange Act of 1948 (Public, 402, approved January 27, 1948). This measure authorizes agricultural cooperation with countries anywhere in the world. Formerly, the authorization extended only to cooperation with Western Hemisphere countries and with Liberia and the Philippines.

Started before World War II, the collaboration has developed greatly, and now helps millions of people in many countries to increase their farm production and trade and to improve their living standards. It harmonizes with the Point 4 program announced in the inaugural address to the Eighty-First Congress.

Primary objectives are an increased exchange of scientific and technical information among the cooperating countries, the training of students in agricultural science and economics, an interchange of trained technical and scientific personnel, establishment in various countries of intergovernmental agricultural stations and research projects, and occasionally the sending of technical missions to foreign countries.

This country has long maintained working relations with other countries to exchange agricultural information. In 1940 it began collaborating with other American republics to promote efficiency and greater production in agricultural commodities which we have to import, and also to assist cooperating countries in raising their levels of consumption and consequently their import requirements. Collabora-

tive projects established in the Western Hemisphere under this program helped the production of rubber, tea, coffee, cacao, kola nuts, cinchona, nutmeg, abacá, jute, henequen, kenaf, ramie, and other crops. Other work in the same program improved health, nutrition, and conservation of soil.

This Government, jointly with other American governments, maintains and develops intergovernmental agricultural experiments in Ecuador, El Salvador, Guatemala, Nicaragua, Peru, Bolivia, and Cuba. Training of scientists, economists, and other technicians is a major aspect of the program. It brings foreign specialists to the United States and sends American specialists to foreign countries. Both groups learn and teach simultaneously, with important mutual benefit. Agricultural missions from the United States have visited countries of the Western Hemisphere, of the Middle East, and of the Far East. Some of the missions have made intensive surveys and offered detailed recommendations for the improvement of agriculture, nutrition, and living standards.

Experience gained in Latin America shows that practice may follow research quickly. Production of complementary or other desirable crops in several Latin American countries starts with the introduction of necessary seeds. Frequently, crops must be tested, but even that is not always a slow process. Once a crop has proved its adaptability to an area, technicians soon discover how farmers may grow it. The next step, to get the new knowledge distributed, takes more time. It may be necessary to set up agencies to advise and guide the farmers. Advice and guidance may extend to methods of financing and to processing and marketing. Collaboration through all these stages may call not only for technical and other help from the United States, but for the development of new agricultural institutions in the cooperating country. Nevertheless, the road is open quite far along. The technical collaboration program has developed rapidly up to now and points to further progress.

Kinship With Point 4 Program

We have here a basis for still broader world collaboration, of the sort contemplated under the Point 4 program. Our cooperation with many foreign ministries and departments of agriculture is close and fruitful already, particularly in the Western Hemisphere. It should not be difficult, with adequate planning and financing, to build by the same model elsewhere. The progress of our collaboration with Latin American countries since 1940 is a hint of what is possible. In that year, with the purpose primarily of helping the other American republics to increase their production of commodities needed by the United States and secondarily of raising their living standards and consequently their demand for imports, we launched a new program of intergovernmental research and action. It began with the assignment of a few specialists to work on urgent technical programs, and evolved into the establishment and operation cooperatively of agricultural experiment stations. Along with cooperative research and experiment in the field went an equally important activity—the training and interchange of specialists. Ultimately the collaboration embraced a wide field of related studies and tasks, from the training of producers

as well as research people along desirable new lines to the actual commercial growing of crops complementary to ours or desired for other reasons. Under Point 4 this pattern of collaboration might apply extensively to other continents.

THE INTERNATIONAL WHEAT AGREEMENT

A significant development in 1949 was the negotiation of an international agreement intended to assure supplies of wheat to importing countries and markets for wheat to exporting countries at equitable and stable prices.

This agreement, signed at Washington in March and April 1949 by 41 countries, provided for an annual trade between exporting and importing signatories of 456 million bushels of wheat—a major portion of the current international trade in wheat. By July 1, 1949, a sufficient number of the signatory countries had formally ratified and accepted the pact to assure its entry into force. Accordingly, an International Wheat Council, with headquarters in London, was organized to administer the agreement during the next 4 years.

An international wheat agreement was negotiated in 1948, but was not ratified by a sufficient number of countries to bring it into force. The 1949 agreement was drawn up along similar general lines. The following tabulation shows the main differences in the provisions of the two documents.

Item	*1948 agreement*	*1949 agreement*
Duration	5 years (48–49 to 52–53)	4 years (49–50 to 52–53).
Total trade	500 million bushels	456 million bushels.
U. S. quota	185 million bushels	168 million bushels.
Exporters number	3	5.
Importers number	33	37.
Maximum price	$2.00 per bushel	$1.80 per bushel.
Minimum price	$1.50–$1.10 per bushel	$1.50–$1.20 per bushel.

As of September 26, 1949, a total of 30 countries had ratified and accepted the 1949 agreement, with Uruguay (an exporter) and Brazil, China, Colombia, Cuba, Ecuador, Guatemala, Liberia, Nicaragua, Panama, and the Philippines among the importing countries not yet in. Wheat began moving on August 1 within the maximum prices established by the agreement. By mid-September a total of about 21 million bushels had been traded. Of this total Canada had supplied about 65 percent.

An illustration of the stabilizing effect of the International Wheat Agreement on world wheat prices was afforded during the recent currency devaluations. According to provisions of the agreement, maximum and minimum prices for wheat in Canadian and Australian currencies, for example, automatically advanced by the extent of the respective devaluations in those countries. Maximum and minimum prices for wheat moving under the agreement remained unchanged in terms of United States dollars.

GRAIN EXPORTS IN 1948–49

Exports of grain from the United States in the marketing year 1948–49 again exceeded previous records. Shipments of bread grains

to foreign countries totaled 506 million bushels; shipments of feed grains, about 178 million bushels. Exports of bread grains and feed grains combined represented the greatest volume of grain ever exported by any nation in a 12-month period. The total (684 million bushels, grain equivalent) was 100 million bushels above the previous record, made in 1947–48.

This huge movement to foreign countries was evidence that world food shortages left by the war had not yet disappeared. Nevertheless, grain production in food-deficit countries was up from the wartime or postwar low in many areas, especially in western Europe. Moreover, crop prospects in 1949 were favorable in most of the world's important grain-surplus producing areas. It was therefore evident, as 1949 drew to a close, that United States grain exports could soon decline, although they would probably hold up substantially above the prewar level.

Considering the export outlook along with our continued large production, and with the likelihood of further recovery in world grain output, the Department expects a declining tendency in world grain prices. This will pose problems for United States producers. Already acreage allotments have been proclaimed for the 1950 crop of wheat—for the first time since 1943. Announced originally at 68.9 million acres, the total allotments assigned to farms will finally be somewhat above the national allotment proclaimed in conformity with Public Law 272, Eighty-first Congress, amending the farm-acreage allotment provisions of the Agricultural Adjustment Act of 1938. With average yields, the acreage expected to be planted to wheat for harvest in 1950 would produce about 1,100 million bushels. This would provide about 700 million bushels for domestic use, a normal domestic consumption; and 400 million bushels to meet estimated export requirements for United States wheat in 1950–51.

Price Outlook for 1950 United States Wheat Crop

With indicated total disappearance of wheat at about the same level of prospective wheat production, carry-over stocks may be expected to remain practically unchanged. Under such conditions of balanced supply and demand, prices for the 1950 wheat crop should average around the support level.

Despite the indicated high level of market outlets, the present grain situation reveals trends that demand study. Even with the record-breaking export movement, crop production has more than kept pace with requirements. The declining trend of exports will give rise to problems of adjustment to maintain a balance between supplies and market outlets. The exportable surplus of bread grains from the principal Northern Hemisphere exporting countries, despite the slight decrease in production in 1949–50, is not expected to show any significant net change from the large 1948 supplies. Wheat crop prospects in the important Southern Hemisphere countries, Argentina and Australia, are more favorable than they were last year.

In the principal wheat exporting countries (the United States, Canada, Australia, and Argentina), wheat stocks on July 1, 1949, were 638 million bushels, or 19 percent higher than on July 1, 1948, when they totaled 536 million bushels. Not considered large, these

stocks were nevertheless 39 percent above the 1935–39 average of 458 million bushels. In the United States the stocks increased 97 million bushels; in Canada 25 million; in Argentina 10 million; and in Australia 10 million. In a word, the grain situation in 1949, with the customary differences attributable among areas to different weather conditions, was pointing toward generally easier supply positions. The United States particularly, with more than 700 million bushels of wheat available for export and carry-over, will be able to meet all likely demands.

As mentioned, the export outlook is not unfavorable for the next year or two. One encouraging element is the International Wheat Agreement that came into force August 1, 1949. Four exporting countries, the United States, Canada, Australia, and France signed the agreement. The importing countries which have thus far ratified the agreement are Australia, Belgium, Denmark, Ceylon, Dominican Republic, Egypt, Greece, India, Ireland, Israel, Italy, Lebanon, Netherlands, Norway, New Zealand, Peru, Portugal, Saudi Arabia, Sweden, Switzerland, the Union of South Africa, the United Kingdom, and Venezuela. Under the agreement the exporting countries agree to supply and the signatory importing countries, including those that have not yet ratified, agree to take 456 million bushels of wheat annually within a specified range of prices. The share of the United States is 168 million bushels—for each of the four crop years 1949–50 through 1952–53.

In addition to these minimum United States exports guaranteed under the wheat agreement, the United States will have to meet the wheat import needs of the United States occupied zones and the requirements of countries not participating in the wheat agreement, as well as the requirements of the wheat agreement countries over and above their guaranteed minimum takings.

The action of the Economic Cooperation Administration to permit Great Britain to use ECA funds for the purchase of Canadian wheat in an effort to alleviate the critical drain on British gold and dollar holdings will help maintain a traditional pattern of international trade with England, Canada, and other countries. Had ECA not granted this relief, British wheat purchases would have been shifted from Canada to the United States. This, in turn, would have entitled Canada to claim other outlets under the wheat agreement, which the United States expected to fulfill. As the result of ECA's action, United States wheat exports will actually be increased, as the United Kingdom agreed to buy about 15 million bushels of wheat which had not been previously planned.

Recent Trends in Wheat Prices

It may be useful to recall recent trends in wheat prices. Wheat prices to growers more than quadrupled between 1940–41 and mid-January 1948. Specifically, they advanced from 67 cents to $2.81 a bushel. The season average of $2.29 for the 1947 crop was a record. Between 1938 and 1944 the Government's wheat-loan program was the most important wheat-price factor. Up to the latter part of 1944 wheat felt little price stimulus from the war. From 1942 through 1945 wheat as feed for livestock was in heavy use and large quantities went

into our war industries. Early in 1945 foreign-aid programs to finance exports became important. Through 1947–48 wheat prices in the United States reflected the unavailability of feed grains for export, the demands incident to short production abroad, and continued advances in the general price level. Big United States production in 1948, along with larger production in importing countries, brought the wheat loan back as a major price-sustaining influence. The preliminary estimate of the price to growers for the 1948–49 crop averaged 1 cent a bushel below the $2 loan level. Under the supply and demand conditions expected, wheat prices should again average close to the support level for 1950 crop wheat.

Production of coarse grains influences the demand and consequently the price for wheat. Feed grains (corn, oats, barley, and grain sorghums) will be in record supply throughout 1949–50. We have a big corn crop, the second largest on record, plus a record corn carry-over. Moreover, the carry-over next year may be as much as 50 percent greater, based on the expected domestic utilization plus probable exports of corn. Carry-over stocks of other feed grains will be above average. Consider also our record 1949 production of rice, which added almost 90 million bushels to the grain supplies; the previous record rice production was 81.2 million bushels in 1948.

More adequate grain storage facilities are an urgent necessity, both on farms and at country and terminal markets.

COTTON SURPLUS ACCUMULATING

The cotton situation in 1948–49 was marked by the seventh largest crop on record, the smallest domestic consumption and largest exports since before World War II, and an increase of 2.2 million bales in the carry-over at the end of the season.

The 1948 cotton crop of 14,580,000 running bales brought the supply of cotton in 1948–49 to 17,900,000 bales. This exceeds the supply for the preceding season by 3,478,000 bales and compares with the 1935–39 average of 21,353,000 bales, of which 5,601,000 bales were CCC loan stocks. The 1948–49 supply consisted of the August 1, 1948, carry-over of 3,080,000 bales, the in-season ginnings and current crop of 14,656,000 bales as estimated as of September 1, and net imports of 164,000 bales.

During the 1948–49 season, domestic demand was weak as compared with the preceding 10 years and domestic mill consumption, at 7,798,000 bales, was the lowest since 1939. In only 7 of the last 40 seasons has domestic mill consumption of cotton declined from one season to the next by as much as 10 percent. These major declines ranged from 10.5 to 28 percent. The decline in domestic mill consumption from 1947–48 to 1948–49 amounted to 1,556,000 bales, or 16.6 percent, the third largest on record.

Not since 1939–40, when mills consumed 7,784,000 bales, has the domestic use of cotton been so low as during the last season. From 1940–41 through 1944–45 the demand for cotton textiles for war purposes brought the domestic use of cotton to the highest levels in American history. Mill consumption ranged from 9.6 to 11.2 million bales, with an average of 10.3 million. During the first 3 postwar seasons, 1945–46 through 1947–48, the demand continued close to the

high wartime levels, and domestic mill consumption average 9.5 million bales.

Part of the drop in domestic mill consumption in 1948–49 was attributed to the decline in industrial production in late 1948 and the first half of 1949. Industrial uses of cotton cloth and yarn account for about 40 percent of the total consumption of cotton. A 36-percent decline in United States exports of cotton textiles from the all-time peak of 1.5 billion square yards reached in 1947 also was responsible for some of the drop in mill consumption in the 1948–49 season. The most substantial portion of the decline in 1948–49 mill consumption probably occurred, however, as a result of the drop during the last year in the domestic demand for cotton textiles for apparel use and for household furnishings, which indicates that the high deferred demands created by the war have been satisfied.

A brighter aspect of the cotton situation in 1948–49 was the exports of raw cotton, which totaled over 4,748,000 bales, more than for any season since before World War II and nearly 2.5 times those in the preceding season. It should be pointed out, however, that about 60 percent of the 1948–49 exports were financed by ECA loans and grants and another 15 or 20 percent were financed by the 150-million-dollar revolving and other United States funds.

The domestic stocks of cotton on hand at the end of the 1948–49 season were 5,283,000 bales, compared with 3,080,000 bales 1 year earlier and 2,530,000 on July 31, 1947. If August 1 stocks were converted at the 1948–49 average rate of disappearance, these stocks would be equivalent to slightly over 5 months' supply.

Ownership of Stocks

The Commodity Credit Corporation pooled 3,800,000 bales, or 72 percent of the total end-of-season stocks, as collateral on unredeemed loans made to cotton farmers during the 1948–49 crop season. The stocks in domestic mill warehouses totaled 884,000 bales, or 16 percent of the total. The ownership of the remaining 599,000 bales was scattered among mills, merchants, exporters, and farmers. The situation at the end of the season was substantially different from that at the beginning of last season, when mill stocks were 1,472,000 bales and accounted for 48 percent of the total while CCC stocks were only 33,000 bales.

Spot prices for cotton (Middling $^{15}/_{16}$-inch) during the 1948–49 season were notably stable and free from wide day-to-day fluctuations. In the 10 spot markets, Middling $^{15}/_{16}$-inch cotton averaged 32.35 cents per pound at the opening of the season, declined slowly until August 23, when the lowest price of the season was reached at 30.69 cents, then advanced gradually until April 25, 1949, when the highest price of the season of 33.37 cents was reached. Prices in May and June continued at nearly the April level, then declined in July, and ended the season at 31.67 cents per pound. In only three other seasons of record have spot prices fluctuated within such a narrow range. The average price for the season was 32.15 cents per pound, compared with 34.58 in 1947–48. The loan program, relatively high exports resulting from the ECA cotton program, and the scarcity of "free" cotton were effective factors in maintaining prices during the season.

Prices received by farmers during the 1948–49 season ranged from 31.07 cents per pound in October to 28.74 in March and averaged slightly over 30 cents per pound for the season. The average farm price for cotton for the season was 98 percent of the parity price but exceeded parity only in October.

The 1949 loan rate for Middling $^{15}/_{16}$-inch cotton is 29.43 cents per pound, average location, or 1.31 cents below the 1948 rate for this quality. During August, the first month of the 1949–50 season, spot prices of cotton declined 1.10 cents per pound and at the end of the month averaged only 0.88 cent per pound above the loan rate.

The 1949 cotton crop was somewhat slightly larger than the large crop in 1948. This crop, together with the carry-over from the past season, will probably bring the total supply to or slightly above 20 million bales. The prospect is that domestic mill consumption and exports will total about the same as last season—12.6 million bales. If supply and requirements are about as currently indicated, the stocks of cotton at the end of the 1949–50 season would increase over those of a year earlier by about 2 million bales and would total around 7.5 million bales. In this event, marketing quotas would be mandatory for the 1950 cotton crop under the provisions of the Agricultural Act of 1938, as amended by Public Law 272, Eighty-First Congress. This act provides that in case marketing quotas are proclaimed for the 1950 crop, the national quota shall be not less than the number of bales required to provide a national acreage allotment of 21 million acres.

Competition of Synthetic Fibers

Cotton produced in the United States is being faced, year by year, with stiffer and stiffer competition for its markets. Domestic markets are being invaded by rayon and other synthetic fibers. Foreign markets are being invaded by both synthetic fibers and foreign-produced cottons.

Cotton consumption in the United States during the calendar year 1948 was nearly 9.1 million bales, 35 percent above the 1935–39 average. Average annual rayon production in 1935–39 was equivalent to 734,000 bales of cotton, or 10 percent of the cotton consumption during the corresponding period. But in the calendar year 1948, rayon production was equivalent to 2,645,000 bales of cotton, 29 percent as high as cotton consumption, and 360 percent above the 1935–39 production. In 1939 no tire cord or tire fabrics (historically, cotton's largest industrial market) were reported by the Bureau of Census as having been made of rayon. In the first half of 1949, over 55 percent of all tire cords and tire fabrics were produced from rayon. Nor is the competition confined to rayon—paper, plastics, and a host of other synthetics are being used in increasing volume in the production of items formerly produced solely from cotton.

Foreign Production of Cotton

The foreign production of cotton, although still below prewar levels, has increased each year since the end of the war. Based on preliminary estimates, foreign production of cotton in 1949 will be slightly over 15 million bales, and for the first time since the end of World War

II will be larger than United States production. Foreign production of rayon in 1948 was 1,353 million pounds, more than double that in 1945. And through plant expansion taking place even now, rayon producing capacity in 1950 is expected to be 2,779 million pounds, four times the 1945 production, and double the 1948 production.

Need of Balanced Cotton Program

To meet this challenge from synthetics inside the United States and from both synthetics and cotton outside the United States, a balanced program for cotton will need to be followed. Lower costs of production through better cultural practices, improvements in processing, finishing, and marketing from farm to consumer to keep pace with advancement of competitive products, and new outlets through continuous research are only some of the sides of this increasingly serious problem.

THE LIVESTOCK INDUSTRY

The livestock industry has enjoyed another favorable year, despite prices somewhat lower than the record levels reached in 1948. Cattle prices throughout the year averaged around 50 percent above parity; lamb prices were maintained at a still higher margin above parity. Hog prices, however, were not as strong and held a comparatively slight margin over parity.

Beginning in late 1948 and extending into early 1949, livestock prices declined sharply from the very high levels reached the previous summer. This decline resulted partly from some weakening in the strong consumer demand for meats that had prevailed early in 1948. Apparently, however, it was part of the general downward readjustment in prices of all agricultural products which started when consumer goods became more readily available for purchase.

Cattle prices to the end of September averaged 11 percent lower than in the previous year, calf prices 4 percent lower, and hog prices 18 percent lower. Prices of sheep and lambs, however, averaged 5 percent higher. These price changes to some extent reflected changes in relative supplies of animals for slaughter. Total live weight of cattle and hogs slaughtered under Federal inspection was greater than in the previous year, but that of calves, sheep, and lambs was smaller.

With abundant feed available from the record corn crop harvested in 1948, cattle feeding expanded, and the production of grain-fed steer beef in 1949 reached an all-time high. The total number of cattle slaughtered, however, was slightly smaller than in 1948 and was very much smaller than the record slaughter in 1947. In contrast to the record steer slaughter, the slaughter of cows was greatly reduced and was the smallest in several years. This indicated increasing confidence among cattlemen as to future prospects for the industry and a willingness on their part to expand production.

Calf slaughter was smaller than in 1948, partly because fewer calves were produced and partly because more calves were held to rebuild cattle herds reduced in numbers during the period 1945–47. A tendency to increase the numbers retained on farms and ranches indicated increased supplies of beef and veal would be available after 1950 to

keep supplies more nearly in balance with increasing population. An increase in cattle numbers will make possible a greater use of grasses and legumes; hence it will help to conserve the soil, and to promote a more balanced agricultural economy along with a high standard of food consumption.

Since the war, our cattle industry has held the most advantageous position in its history. In comparison with long-time prewar relationships, the purchasing power of cattle has been much greater than that of practically all other agricultural commodities. Moreover, this advantage may continue for some time, even if cattle numbers increase considerably.

In mid-August 1948 the Canadian Government removed its wartime embargo on exports of cattle and beef from Canada and a very large export movement to this country developed and continued until near the end of that year. The movement in 1949, however, was considerably smaller because a marked reduction had occurred in cattle numbers in Canada.

Sheep Industry in Strong Position

The long downward trend in sheep numbers which began in 1942 appears to be ending. Stock sheep numbers at the beginning of 1949 totaled less than 28 million head, a new low in numbers since the Civil War; it was 22 million head less than the peak reached in 1942.

The 1949 lamb crop was the smallest for all the years of record, which go back to 1924; probably it was the smallest in more than 50 years. Slaughter of sheep and lambs declined greatly below last year's level. Slaughter and death losses for the year, for the first time since 1941, may not exceed the number of lambs born during the year.

The sheep industry is now in a stronger economic position than it has been for many years. Production costs are expected to decrease somewhat, whereas lamb prices, because of reduced output, are likely to continue high, as compared with prices of most agricultural products. Sheep numbers, however, are not expected to increase to prewar levels; the conditions that permitted rapid expansion in former times no longer prevail.

The price-support program on wool was continued at an average of 42.3 cents per pound for shorn wool in the grease. Through September, however, the open-market price on wools finer than 3/8 blood was above the support price, and most of such wools were taken by trade interests. Total Government purchases in 1949 under the support program represented less than one-third of the current annual production. During the year the inventory of wool previously purchased under the support program was materially reduced.

Hog Production Outlook

The record corn crop of 1948 made possible increased hog production in 1949 and pointed to a larger output of pork in 1950. The 1949 spring pig crop was 9 million head larger than that in 1948, an increase of 15 percent. Producers indicated they expected to increase the fall pig crop by 3 million head, or 9 percent. This will mean larger supplies of hogs for slaughter from August 1949 to late 1950, and also into

1951 if there is further increase in the number of pigs raised in 1950, as is now expected.

Increased production and marketing of hogs may cause hog prices in 1949–50 to be moderately lower than those of the preceding year. But prices may not reach the support levels of 90 percent of parity announced to be in effect to the end of March 1950. Although price supports for hogs, set at 90 percent of parity, have been in effect since the war ended, no Government action had been required to the end of September 1949 to support prices.

Total meat production in 1949 was slightly larger than in 1948, as a result of the increased slaughter of hogs and the heavier weights of cattle slaughtered. The percentage increase in meat supplies was about equal to that in population; hence the production per capita was about the same as in the previous year.

DAIRY PRODUCTION, PRICES, AND PRICE SUPPORTS

Milk production for 1949 will be slightly higher than in 1948. It was 2 percent over the 1948 level in the first 8 months of the year. Total milk production for 1949 may be about 117 billion pounds, as compared with last year's production of 115.5 billion pounds. This would make the 1949 production about 4 percent below the peak output of 1945. Numbers of milk cows on farms, which had been declining for 5 years, began to level off. Except in parts of the Midwest, the numbers in all regions were within 1 percent of the 1948 figures. Average milk production per cow reached a new high record, at more than 14 percent over the prewar level.

Pasture conditions during the 1949 pasture season were about equal for the country as a whole to the exceptionally favorable conditions of 1948. Only in the North Atlantic area was any serious drought experienced. Even there milk production per cow was within 1 percent of the 1948 level. This high production largely reflected increased feeding of grain concentrates to dairy cows. Grain feeding in all regions of the country was higher than in the previous year and was an important factor in the milk production gain.

Consumption of fluid milk and cream per person declined slightly, yet it was still about 15 percent above prewar. Total consumption of milk and cream remained at the 1948 level. Growth of population sufficed to offset declining consumption per capita. Fairly stable consumption of fluid milk and cream, in a period of increased milk production, left more milk available for manufacturing. Output of butter and cheese increased sharply; nevertheless, the production of most other manufactured dairy products was somewhat smaller than in 1948. Exports of major dairy products declined during the latter part of 1949, largely because the United Kingdom curtailed its purchases. The demand for dairy products weakened owing to a decline in domestic purchases for storage. Purchases for storage normally constitute an important element of demand during the season of peak production. Uncertainty as to the price outlook during the spring and early summer of 1949 influenced this aspect of the market situation.

As a result of these changes in production and demand, the prices received by farmers for milk during 1949 dropped considerably. The

average price received by dairy farmers during the first 8 months was more than 16 percent less than the average for the corresponding period of 1948. Farm prices for milk in the September–December period may compare more favorably with those of 1948. Nevertheless, for the year as a whole, cash receipts from farm marketings of dairy products may fall below those of 1948 by about 15 percent. Fortunately, the costs of producing milk will average lower also; hence, the incomes of dairy farmers will not decline as much as the decline in prices might indicate. As mentioned, pastures have been good in most parts of the country, and feed crops have been abundant. Feed concentrates are considerably lower in price than they were a year ago. In consequence, the dairy product-feed price ratio is more favorable to dairy farmers now than it was in the middle of 1948, when dairy prices were at their peak.

Price Supports for Some Dairy Products

With prices of milk and butterfat down to support levels the Department, as required by the Agricultural Act of 1948, undertook to maintain these prices at support levels. It announced in February that it would support the price of Grade A butter at 59 cents a pound in any section of the United States up to September 1 and at 62 cents thereafter. It announced in April that it would support the prices of roller and spray nonfat dry-milk solids at 11.5 and 12.5 cents a pound, respectively, and that after September it would advance these prices by half a cent. Also it purchased nonfat dry-milk solids on a large scale. These actions proved to be not sufficient for the maintenance of support-level prices to farmers for milk for manufacturing purposes. Accordingly, in July the Department brought cheese into the support program, and announced an immediate increase of 3 cents a pound in the butter-price support level. The earlier plan did not call for this advance until September 1. Up to mid-September, the purchases under the support program reached the following totals: Butter, 76 million pounds; cheese, 23 million pounds; nonfat dry milk solids, 332 million pounds.

Meantime, the Department continued its regulatory and service programs for establishing minimum prices to be paid dairy farmers for milk in city markets in various parts of the country. Federal orders issued under the Agricultural Marketing Agreement Act of 1937 were in effect during the fiscal year 1949 in 33 marketing areas. Under these orders, approximately 140 thousand producers delivered about 16 billion pounds of milk valued at 720 million dollars.

POULTRY AND EGG PRODUCTS

The poultry work of the Production and Marketing Administration during the past fiscal year has been characterized by a continuous price-support program through the purchase of dried eggs and the sale of egg products to the ECA and other governmental agencies. Such purchases from January 1 to September 1, 1949, totaled over 58 million pounds.

As a result of the type of support program used and the level of price paid, egg prices were supported at exactly 90 percent of parity during the calendar year 1948, and up through August 1949.

The need for the price-support program came about almost entirely because of an excessive production of eggs in the areas where egg quality is generally the lowest. Since production in these areas is far in excess of local consumption, it was necessary for these lower quality eggs to find an outlet. They were able to command only a low price, which would have lowered the national average price received by farmers for all eggs sold. On the other hand, egg prices on the two coasts and in the Southeast were relatively high and consumer prices in those areas for the top grades last fall were generally in excess of 80 cents a dozen. Although per capita egg consumption for 1948 totaled 386 eggs, more could have been consumed during the last 6 months of that year if current production in the low-quality areas had been of higher quality.

It had been thought that the comparatively small hatch for flock replacement purposes in the spring of 1948 would have meant a smaller production of eggs during 1949. Feed prices during the 1948 hatching season had been so high as to discourage many farmers from buying their normal number of replacement chicks. It was, therefore, reasonable to believe that egg production this spring would have been down from 2 to 5 percent from a year earlier.

This proved not to be the case. Farmers retained a larger than normal proportion of both their young pullets and old hens in the fall of 1948. This, coupled with a high rate of lay in the early months of 1949, resulted in a production slightly larger than a year earlier, during the first 6 months of 1949.

Factors That Necessitated Price-Support Action

This increase in production, however, is not sufficient in itself to explain why it has been necessary to support egg prices during the spring and to buy over 57 million pounds of dried eggs since January 1, compared with about 22 million pounds during the first 8 months of 1948. Probably the most important factor necessitating a price-support program has been the sharp reduction in the into-storage movement of both shell and frozen eggs during the first 6 months of 1949. As of August 1, 1949, there were over 5.4 million fewer cases of shell and frozen eggs in storage than a year previous. Since total consumption was practically the same for the first 8 months of both 1948 and 1949, it can be said that it was necessary to purchase the slight increase in production as well as the volume that the trade failed to store compared with last year.

The high price of feed during the spring of 1948 caused a reduction in the total hatch of baby chicks, as mentioned previously. This also applies to turkeys. Consequently, prices for neither chickens nor turkeys were in need of support during the 1948–49 marketing season (in the fall and winter months). Because of the small crop of turkeys, turkey prices rose to record levels and those producers who did raise turkeys made substantial profits. These relatively good returns, together with declining feed prices in the spring of 1949, led farmers to buy many more turkey poults than a year ago. The August 1949 BAE production report estimates that farmers this year raised 41,107,000 turkeys, or 29 percent more than last year. An increase of such magnitude will probably require price support. Such a program was announced on August 1, to become effective at that time.

The short crop of chickens in the fall of 1948 resulted in a substantially larger demand for commercially raised broilers. Broiler production, therefore, reached record levels during the spring of 1949. Although the Department is not obliged under the Steagall Amendment nor the Agricultural Act of 1948 to support the price of commercially raised broilers, growers have been cautioned on the possible consequence of their large production.

TOBACCO

The United States is the world's leading tobacco producer, consumer, and exporter. Its annual harvest of tobacco in the last few years has averaged about 2 billion pounds, or approximately 30 percent of the world total. In the postwar years, 1946, 1947, and 1948, United States exports have constituted about 50 percent of all unmanufactured tobacco entering world trade.

Immediately after World War II, United States tobacco exports increased to a level approximately 60 percent above the the prewar average, but as a result of a shortage of dollar exchange in most important importing countries they have since declined and are currently only slightly above the prewar level. United States exports in 1948 totaled 427 million pounds, as compared with 507 million pounds in 1947, 663 million pounds in 1946, and the prewar, 1935–39, annual average of 421 million pounds.

As a result of stock accumulation caused by curtailed exports after July 1947 the United States tobacco acreage was reduced in 1948, but it increased slightly in 1949, primarily as a result of an improved outlook for exports to countries participating in the European Recovery Program. Production of all types was forecast as of August 1, 1949, at 2,019 million pounds. This is 2 percent above the 1948 harvest, but 4 percent below the 1947 crop, and 13 percent below the record 1946 harvest. The increase in 1949 is all accounted for in the production of flue-cured tobacco which is estimated at 1,161 million pounds, as compared with 1,090 million pounds in 1948.

Domestic consumption is expected to continue at the high level of recent years. The trend has been upward for many years and some further increase may occur, though at a rate below the recent average. Cigarette consumption has increased rapidly during the war and postwar years and in 1948 was 5 percent above the 1947 level and more than double the prewar average. The consumption of smoking and chewing tobacco has declined in recent years, but consumption of other products has not changed greatly since before the war.

Countries participating in the European Recovery Program normally take about 70 percent of the United States leaf exports, the United Kingdom alone accounting for about 50 percent. At present, large quantities of leaf are being provided these countries under this program, but this assistance plus what they are able to purchase with earned dollars is still insufficient to meet their minimum requirements.

Preference for United States Tobacco

Practically all of the important tobacco-importing countries of the world have a preference for United States-grown tobacco. During the war, the distribution abroad of American-type blended cigarettes and other products containing American leaf increased this prefer-

ence. This trend to American tobacco was accelerated by decreased production of leaf in war-torn countries; the United States became the principal source of leaf tobacco immediately after the war, when these countries were trying to replenish their stocks and obtain sufficient tobacco to meet consumer demand. Manufacturers in these countries report that if they could obtain adequate dollar exchange and were permitted to make their own selection of leaf they would substantially increase their consumption of American tobacco.

American tobacco farmers have demonstrated during the war and postwar years that they can produce sufficient leaf to provide for domestic consumption and for the potential export demand. However, high prices for United States leaf and a shortage in dollar exchange have led importing countries to purchase in other areas and to encourage their own production of tobacco. As a result of their shortage of dollar exchange the United Kingdom and other tobacco-importing countries of Europe are encouraging the importation of maximum quantities of leaf from countries that will accept their currencies. Many tobacco-producing countries in Europe and Asia are finding it advisable to increase domestic production. The quantity of United States leaf purchased by importing countries in the future will probably depend largely on their ability to obtain dollar exchange and on the price competition offered by other surplus tobacco-producing countries.

SUGAR

The Production and Marketing Administration's sugar programs are authorized by the Sugar Act of 1948, the Commodity Credit Corporation Charter, and the Research and Marketing Act of 1946.

The Sugar Act programs aim to provide domestic household and industrial consumers with adequate supplies of sugar at reasonable prices which will, at the same time, fairly and equitably maintain and protect the welfare of the domestic sugar industry.

The total sugar requirements of consumers for each year are determined by the Secretary of Agriculture. Quotas regulate the entry of sugar into the continental United States from foreign areas and the marketing of sugar by domestic areas. Payments are made to domestic producers of sugarcane and sugar beets who do not market in excess of specified quantities, who do not employ child labor, who pay wages deemed to be fair under the standards established in the act, and (in the cases of processor-producers) who pay other producers for sugarcane and sugar beets prices that are determined to be fair and reasonable.

Sugar is procured through the CCC for the Department of the Army for civilian feeding in occupied areas and for the Economic Cooperation Administration for use by nations receiving aid under that program. Marketing research is also done on sugar and related products.

Quotas

Sugar consumption requirements and sugar prices in the United States during the fiscal year 1949 were very stable. The requirement of 7,200,000 short tons, raw sugar basis, for 1948 was in effect for the first half of the fiscal year 1949 and the original determination of annual requirements of 7,250,000 short tons for the calendar year

1949 prevailed through June 30, 1949. The high and low monthly average prices of raw sugar at New York varied by less than one-quarter of a cent per pound.

Some of the sugar-producing areas did not fill their quotas and the resulting deficits were prorated to other areas which could supply the sugar. The adjusted quotas in effect on June 30, 1949, were as follows:

Area:	*Short tons, raw value*
Domestic, beet	1,600,000
Mainland, cane	500,000
Hawaii	1,052,000
Puerto Rico	970,635
Virgin Islands	6,000
Philippines	557,000
Cuba	2,515,915
Other foreign countries	48,450
Total	7,250,000

In the calendar year 1949, as in 1948, each Puerto Rican refiner who shipped direct-consumption sugar to the mainland was limited to an allotment of the direct-consumption portion of the Puerto Rican quota. In 1949, allotment of the over-all mainland and local-consumption quotas for Puerto Rico limited the amount of sugar each processor of raw sugar could ship to the mainland and the amount each could market for local consumption in Puerto Rico. This was the first time since 1941 that over-all quotas for any area were allotted.

Wages and Prices

Fair and reasonable wage rates were set under the Sugar Act of 1948 for about 80,000 agricultural workers in the sugar-beet areas, and 50,000 in Louisiana, 5,000 in Florida, 12,100 in Hawaii, 115,000 in Puerto Rico, and 1,000 in the Virgin Islands. The rates established are the minimum rates which must be paid by a producer as one of the conditions for payments under the act. The basic wage rates remained about the same during the fiscal year as in the previous year but some changes were made in the way they were applied.

Fair and reasonable sugarcane prices were established for each of the domestic cane areas for the 1948 crop. Producers of sugarcane who were also sugarcane processors were required to pay about the same prices for the sugarcane they bought from other producers as they did in the previous year. Some changes in price requirements were made which applied in Louisiana, Florida, and Puerto Rico, but the price requirements were unchanged in Hawaii and the Virgin Islands.

To provide a broader and more adequate basis for the determination of fair and reasonable wages and prices, the Department continued to study the effect that current technological improvements have had on the costs and man-hour requirements of growing and processing sugarcane and sugar beets.

Payments to Producers

Payments conditioned on producers' compliance with the child-labor, wage, price, and marketing requirements of the Sugar Act,

were made to producers of sugarcane and sugar beets. About 85,000 producers received approximately $62,000,000 on 1947 crops; and approximately $56,000,000 went to nearly 72,000 producers on 1948 crops. Procedural changes made in the first half of the fiscal year resulted in payments being made much earlier than formerly in the sugar beet area, Puerto Rico, and the Virgin Islands.

The Sugar Act requires that "proportionate shares" be established annually for each farm in the several domestic sugar-producing areas. Each farm's share represents its portion of the over-all production objective for the area. The proportionate shares established for the 1948 crops did not restrict the marketings of sugar beets or sugarcane in any area. However, a record quantity of sugar produced from the 1948–49 sugarcane crop in Puerto Rico resulted in the announcement of a determination for restrictive proportionate shares on the 1949–50 crop to avoid an excessive carry-over of sugar into 1951.

Purchases for the Army and ECA

The CCC, during the fiscal year 1949, purchased sugar for the Army and ECA. All of the sugar was bought from Cuba and consisted of about 225,000 short tons of 1948-crop sugar and about 443,000 short tons of 1949-crop sugar. The sugar was used by the Army for civilian feeding in Germany, Japan, and Korea. ECA sugar went to Austria, French-Zone Germany, and Bi-Zone Germany.

The purchase price on the 1948-crop sugar was 4 cents per pound free-alongside-ships in Cuban ports. This price was considerably below the average monthly price of raw sugar on the world market for the months in which the sugar was delivered. The 1949-crop sugar was bought on a special pricing arrangement which specified 4 cents per pound for the first 159,000 short tons and an average market price on the remainder; in no case was the price to exceed 4 cents per pound.

Price Supports

No price-support program was in effect for 1948-crop sugarcane or sugar beets because of the protection provided producers under the Sugar Act of 1948. The last of the beet sugar from the 1947 crop of sugar beets, on which a price-support program was effective, was sold by processors by the end of June 1949. The total cost to CCC of this program was approximately $16,505,000, of which about $4,644,000 was paid out during the fiscal year 1949.

Marketing Research

Research was carried out to find the quantity of corn sugar and sirup, dry and liquid cane and beet sugar used as sweeteners by various industrial users and to find out why they chose and used particular sweeteners. Preliminary results on part of the survey showed that the use of corn sweeteners in relation to over-all sugar use increased greatly during the war and remained above prewar levels during 1948 and the first half of 1949.

Surveys of sugarcane marketing were made and preliminary work was done on the marketing of refined sugar, raw sugar, and blackstrap

in Puerto Rico and Louisiana. Information relating to marketing methods and practices was collected from Louisiana and Puerto Rican processors. For Louisiana sugarcane, a report was prepared covering a description of the present marketing structure and making recommendations for improved marketing methods and practices.

Information was collected from mainland producers and distributors of cane sirups, edible molasses, refiners' sirups, and liquid sugar relative to (1) method of classification; (2) influences of various factors which caused the producer or distributor to make or sell different qualities and types; (3) feasibility of setting standards for each group of these products; and (4) recommendations as to the number of grades which should be established for each of the products. Samples of these products have been collected for analysis in connection with the possible establishment of grades and standards for them.

FATS AND OILS SUPPLY INCREASED

The world's supply and consumption of fats and oils showed general if slow improvement. Although the supply was slightly greater than in 1948 and 1947, it was still well below prewar. Also, the distribution of these commodities improved. In January these developments brought a sharp decline in prices, particularly in the dollar areas. Accordingly, as of February 10, the International Emergency Food Committee stopped recommending allocations of fats and oils; and in the United States the Department of Agriculture subsequently applied various mandatory price supports.

Record production in 1948 of peanuts and soybeans, and a near-record output of flaxseed, followed in 1949 by increased production of peanuts, cottonseed, butter, lard, tallow, and whale oil, strengthened the world supply position. There were slight increases in 1949 in the production of copra, palm oil, and palm kernels. World trade in fats, oils, and oil-bearing materials increased substantially. The total world exports for 1949 probably exceeded the estimated 4.0 million tons of 1948 by 10 percent. Yet the trade was considerably below the prewar average of 6.5 million tons. Shipments from countries with hard currencies to countries with soft currencies suffered from exchange difficulties, particularly the dollar shortage.

Nevertheless, exports of fats and oils from the United States reached an all-time high. Cottonseed oil, flaxseed, linseed oil, peanuts, peanut oil, soybeans, soybean oil, lard, and tallow were principal items. The Economic Cooperation Administration and the Army provided funds for exports to various European countries and to Japan, and considerable quantities of fats and oils left the United States under private financing. Canada made large stocks of flaxseed available for export, chiefly from the crops of previous years. Exports of fats and oils from Argentina were greater than in 1948—notably exports of linseed oil, sunflower seed, and tallow for Europe. Europe received offers of soybeans from Manchuria, in prewar years the world's major source of soybean exports. Exports of fats, oils, and related materials from China and India continued to be small, owing partly to the continuance of political disturbances in those countries and partly to an increase in their domestic consumption.

Exports of copra and coconut oil from Far Eastern areas increased slightly from the 1948 level. Exports of palm oil and palm kernels

from Indonesia and Malaya increased also though they were still far below the prewar level. Exports of whale oil from Norway increased slightly. Exports of olive oil from Mediterranean countries declined sharply, because the olive crop harvested late in 1948 was poor. Exports of fats and oils and of oil-bearing materials from the United States and other surplus-producing countries effected a great improvement in Europe's position and measurable improvement in Japan. Some countries relaxed or lifted their rationing of fats and oils; other countries, notably the United Kingdom, Germany, and Austria, did not.

Probably the world's supply of fats and oils will be smaller in 1950 than in 1949. Production in 1949 of oilseeds whose oils will become available in 1950, except peanuts, cottonseed, and olives, dropped to some extent. The output in 1950 of coconut, palm, palm kernel, and babassu kernel oils may increase a little as compared with 1949, but probably not sufficiently to offset the other vegetable oil declines. Production of animal fats and marine oils also may increase, though possibly not enough to offset the decrease in vegetable oils.

Consumption is rising. In the United States, on a per capita basis, the consumption of fats and oils in 1949 was nearly up to prewar; and Europe reported some improvement, though with much variation by countries and with an average rate still much below prewar.

Price Supports for United States Products

Price supports were in effect in the United States for cottonseed, flaxseed, peanuts, and soybeans produced in 1949. The programs supported prices at 90 percent of parity as of specified dates. Peanuts were subject to marketing quotas. Among the animal fats, butter was the subject of price supporting action. Necessity for these price supports partly reflected our large production of fats, oils, and oilseeds in 1948. Flaxseed, peanuts, and soybeans in that year were record crops; and cottonseed output was the largest in a decade. Additional pressure on prices resulted in 1949 from large production of lard and tallow.

Production of fats and oils in the United States in 1950 may be about the same in 1949. Vegetable-oil output probably will be down, but our large pig crops will mean more lard and grease. Moreover, our large corn crop will encourage another large pig crop so that lard production will consequently be heavy in 1950. Tallow production will be close to that of 1949. Exports of fats and oils will continue heavy.

FRUITS AND VEGETABLES

Marked contrasts in fruit production and prices developed during 1949. The production of deciduous fruit was more than one-sixth larger than in the previous year and was second only to the record crop of 1946. Production of tree nuts was at the record 1948 level. Production of citrus fruits, however, suffered from unfavorable weather. Freezes early in 1949 severely damaged the citrus crops of California, Arizona, and Texas and the total citrus production in the 1948–49 crop year was the smallest since 1942–43. Supplies of fresh and canned citrus were unusually low in the summer of 1949.

It was evident, too, that as a result of the spring freezes the Texas grapefruit crop in 1949–50 would be smaller than usual. Further damage to the citrus prospect resulted from a severe tropical storm in Florida in August.

Among the deciduous fruits, pears, sweet cherries, and clingstone peaches were record crops. Total peach production was larger than the average and one-sixth larger than the 1948 crops. The apple crop in commercial areas was the largest since 1939, and much larger than the relatively short crop of 1948. Grape crops were about as large as in 1948 and close to the record. Production of almonds, walnuts, and filberts was a new record high for these crops. The near-record deciduous production involved marketing difficulties, and growers had to leave quantities of some fruits unharvested.

Broadly, the contrast between the large production of deciduous and the small production of citrus fruits had an inverse counterpart in prices. Early in 1949, the prices of apples and pears, which had been in short supply from the previous small crop, were higher than in the early months of 1948. Following the big deciduous production of 1949, prices of deciduous fruits dropped to the lowest levels since 1942. Growers of deciduous fruits received much less income than in recent years, owing to reduced sales in the first half of the year and reduced prices in the second half. On the other hand, prices of citrus fruits, because of the reduction in supplies, rose much above those of 1948. Both fresh citrus fruit and canned citrus juices advanced sharply at retail. Moreover, citrus prices remained high all summer. Nevertheless, total 1949 income to growers from fruits may be smaller than in 1948 and smaller than in other recent years. Meanwhile, production costs remain high.

Low prices and other difficulties involved heavy culling of small-sized fruit. Canners as well as growers had marketing difficulties; canners had increased carry-over stocks of fruits packed at high costs. Stocks of wine in the country were high; the demand for wine grapes was weaker and left more grapes for drying into raisins. In these circumstances, the Department of Agriculture gave help. It purchased quantities of apples and Pacific coast pears for school lunch and institutional feeding programs; also nearly a million cases of canned peaches. In August it announced a program to aid producers in marketing raisins. This program subsidized exports of raisins to European countries eligible for ECA assistance and made diversion payments on raisins diverted from normal outlets. There was a similar program on dried prunes. Payments were made on shipments of oranges, apples, and winter pears to ECA countries.

Government Aids Distribution

Earlier in the year the Department had several programs in operation to assist producers in finding outlets for fruit. These were a domestic diversion and export program for winter pears, a purchase and export program for dried fruits and processed citrus fruits, and an export program for fresh citrus fruit. The largest of these programs was that for dried fruits. In the dried-fruit program the Department purchased nearly 60,000 tons of raisins and 64,000 tons of dried prunes. A small part of these purchases was utilized in

school lunch and institutional feeding, and much of the rest was shipped to ECA countries.

Commercial exports of most fruits in the 1948–49 season were smaller than in the preceding season, and the Department's programs were only a partial offset. Exports of fresh apples, for example, were only half as large as in the previous year; exports of pears only one-fifth as large; and exports of oranges moderately smaller, though grapefruit showed a gain. Another year of small commercial exports is in prospect. Export programs will provide some help. Fortunately, the domestic consumption remains high. Total domestic consumption of fruit in 1949 was at the level of 1948—approximately 215 pounds per capita on a fresh equivalent basis.

Important developments in fruit marketing drew wide attention. Among them was a notable increase in shipments of fruit by motortruck. Truck shipments of fresh citrus from Florida in 1948–49 were almost twice those of the preceding season and truck shipments of grapefruit from Texas increased. Fruit shipments by truck from the Pacific coast accounted for an increased proportion of the output, and penetrated deeper into Midwest markets.

Another development was expansion of prepackaging in consumer-size containers. The manufacture of frozen concentrated orange juice continued to increase. This process was first introduced in the 1945–46 season. The 1948–49 pack was about four times the 1947–48 pack and required about 9 percent of the orange crop.

Vegetable Production and Prices

Production of vegetables in 1949, both for the fresh market and for commercial processing, was not quite one-tenth smaller than the total produced in 1948. The reduction in fresh vegetables occurred primarily as the result of lower average yields per acre in most areas and moderate reductions in acreage in some areas. Acreages of tomatoes and sweet corn planted for commercial processing were considerably smaller in 1949 than in 1948. The year began with a plentiful supply of onions and cabbage in storage. Prices received by farmers for fresh vegetables averaged lower than a year earlier in the first half of 1949 and higher in the last half. Prices for processing crops were generally somewhat lower, though still high by prewar standards. Consumption of sweetpotatoes reflected small supplies and high prices. The commercial pack of canned vegetables was smaller than in 1948, primarily because of reduced production of tomatoes for processing. The pack of frozen vegetables was of near-record size.

LEGISLATION FOR STORAGE FACILITIES

From its birth in 1933 up to June 30, 1948, the Commodity Credit Corporation was under no restrictions as to its authority to provide storage facilities for its own commodities. Its authority in this respect suffered a limitation under the Commodity Credit Corporation Charter Act (Public Law 807, 80th Cong., effective June 30, 1948). That law included a restriction which prevented the CCC from taking effective action to provide storage when commercial facilities were inadequate.

The President recommended to the Eighty-first Congress that this restriction be removed. Anticipating favorable action on the recommendation, the Production and Marketing Administration suggested steps that might be taken. Grain storage was short in most sections of the country, and in some sections storage facilities were inadequate for other crops. It had been difficult during the war years, because of shortages of labor and materials, even to maintain existing storage facilities.

Legislation became effective on June 7, 1949, which made it possible to take action. Accordingly, the Department announced a broad program to develop more adequate storage facilities, especially for grain. To farmers for the construction of farm storage for grain, CCC made loans up to 85 percent of the cost. In addition the Department announced that farmers who would reseal or retain grain on their farms for a second year, instead of delivering it to the CCC under the price-support program, would be paid storage fees comparable to the cost of storing such grain in commercial facilities. In the Southwest, the wheat harvest was already under way, and some grain there had to be stored on the ground or in temporary facilities. On grain thus handled in that area, the CCC made distress loans pending the provision of permanent storage.

Also the CCC announced it would acquire grain bins and comparable storage of the semipermanent type for use in storing corn which would be delivered to CCC under the price-support program. There was urgent need for additional corn-storage facilities. An estimate of the amount of corn from the 1948 crop likely to be delivered to CCC under the price-support program, along with a calculation of the amount that could be stored in commercial elevators and in emergency storage facilities, such as unused airplane hangars and other buildings under the control of Government agencies, indicated that additional storage would be needed to handle between 270 and 300 million bushels of corn. Contracts were let for the purchase and erection of grain bins and other semipermanent structures which could be readily dismantled, moved elsewhere, and used for other purposes when no longer required for the storage of Government-owned grain.

A program designed to encourage the expansion of commercial facilities was put in operation. Under this program Commodity Credit Corporation entered into agreements to utilize 90 percent of the capacity of new elevators for a period of 2 years in areas where large amounts of corn would be delivered to the Corporation.

ADJUSTMENTS IN FARMING TO CHANGING WORLD SITUATION

Bountiful harvests of practically all United States crops in 1949 will meet all urgent needs and build up sizable reserve stocks of important foods and feeds. Some big adjustments are needed to meet this situation. With its expanded productive capacity, it will not be easy for agriculture to make these adjustments. But the present economic situation is less favorable to farmers than that of recent years.

Farm prices have come down about 17 percent since the middle of 1948. Prices paid by farmers, on the other hand, have stayed close to their peak level, and are now only about 3 percent less than a year ago. Hence adjustments in farm production are indispensable, if difficult.

Wheat growers may be among the first of our farmers to run into difficulties. Even if the demand for United States wheat remains above prewar levels, adjustments from the acreages of recent years will be needed. The total acreage allotment for the 1950 wheat crop will be about 12 million acres under the plantings for the 1949 crop. Average yields on an acreage not reduced from the recent levels would produce possibly unmanageable wheat surpluses. For the years immediately beyond 1950, the prospective demand for wheat is smaller than for 1950.

Our domestic use of wheat for food is likely to remain fairly stable at about 500 million bushels. Exports, which have ranged from 400 to 500 million bushels in each of the last 3 years, are likely to drop perhaps down to somewhere between 250 and 300 million bushels annually. Wartime heavy feeding of wheat to livestock is past. Over 100 million bushels of wheat were used for alcohol in some war years; but the competition of synthetic alcohol has made a bushel of wheat worth less than 50 cents for conversion into alcohol. With such outlets shrinking, and the foreign demand uncertain, there is danger of wheat surpluses.

Many wheat farmers will increase their acreage in summer fallow and put their less productive land into grass. Much recently broken land in the Great Plains is not suited to continuous crop production. Such land should be returned to grass along with portions of the cropland in established wheat areas. This will protect the soil from erosion and retard the depletion of soil fertility. Areas so handled would constitute a reserve on which agriculture could draw in possible future emergencies. On some wheat farms profitable livestock enterprises could be established by combining the use of new improved grasses with the feeding of excess wheat and other farm feeds to cattle and other animals.

Farmers in the South face a need to reduce the acreage of their major cash crops. The supply-and-demand situation is not favorable for cotton. Hence in 1950, cotton-acreage allotments will be in effect for the first time since 1942. Acreage allotments for tobacco and peanuts will be in effect. Allotments for these crops will call for a reduction of 5 to 6 million acres from the acreages harvested in 1949. One problem in the South will be to find profitable uses for land withdrawn from cotton, tobacco, and peanuts. Smaller acreages of cash crops, and perhaps lower prices, will oblige farmers to emphasize practices that reduce costs.

New pasture and forage crops adapted to southern conditions have been developed in recent years. Some farmers in most parts of the South are putting more emphasis on pasture and livestock. Many may find this a profitable adjustment. The farm wood lot, often a neglected enterprise, is getting more attention. Such changes can provide immediate returns and facilitate conservation.

Adjustments in Corn Belt and Dairy States

Farmers in the Corn Belt increased their acreage of intertilled crops in the war years; many continued to do so during the world food crisis that followed the war. With more than 10 million acres of Corn Belt land diverted from grass into corn, soybeans, and other intertilled crops since 1940, the balance among Corn Belt crops is not what it should be. Much Corn Belt land should go back to grass to protect the soil. More hay and pasture should be fed to livestock. Grazing lands and harvested forage lands in the United States under present uses probably cannot safely carry more than 80 million roughage-consuming animal units, the height of past peaks. Carrying capacity for cattle and sheep cannot increase much more through reduction in the number of work animals on farms and ranches. If we want more beef for more people, farmers must provide more pasture and hay.

Dairymen have better chances than most other producers for widening their market outlets. Production at lower costs will increase consumption; and lower costs are possible through wider adoptions of good dairy practices. Dairy farming has improved rapidly of late. Pasture and hay are suppling more of the feed required in dairying. Benefits to dairying from hay and pasture crops are increasing in the Northeast, the Lake State, and other areas. Improved methods of growing and harvesting forage crops boost yields and reduce costs. Good quality forage crops help to improve feed rations.

Oilseed producers are still in a relatively favorable position. Demand for oilseeds may stay fairly good for several years. Prices will probably stay well above prewar levels.

The adjustment problems of vegetable and fruit growers will turn on general business conditions. Prices for vegetable and fruits respond quickly to changes in consumer purchasing power. Foreign outlets for fruit, a luxury product for most foreign consumers, are less favorable now than in prewar years. Quick-freezing techniques and new methods of transportation and distribution may bring big changes in the next few years. Quick-frozen vegetables may take over some of the market.

Citrus growers face an unfavorable outlook. Citrus output, already very large, will rise for a number of years as growing trees mature. (Over half the present acreage of grapefruit and oranges was planted after 1924. For the most part these trees will not reach full maturity for another decade or more). Yet, production of grapefruit, oranges, and lemons even in 1948 was more than 50 percent above the 1937–41 average. It is evident that citrus marketing will present difficulties in the years immediately ahead.

OUR FARM POPULATION

The number of people living on farms in the United States increased slightly during 1948. This increase was due to an excess of births over deaths in the farm population. Net migration was away from farms. The farm population in January 1949 numbered 27,776,000, as compared with 27,440,000 in January 1948. During 1948, the rate

of increase in the farm population was 1.2 percent, slightly under the 1.7 percent increase that occurred in our total pouplation. At the beginning of the year the farm population made up 19 percent of the civilian population of the United States, nearly the same as in the last few years though significantly less than the prewar proportion. In 1940 the proportion was 23 percent.

Births to farm residents exceeded deaths of farm residents by nearly a half million. Birth rates were high in both the farm and nonfarm populations and only slightly under those of the record year of 1947. A rise in the birth rate followed demobilization from the armed forces after World War II. Though down slightly from the peak reached in 1947, the 1948 rates were still far above those of the 1930 decade. In contrast, death rates in the farm and nonfarm populations were significantly lower than in the prewar period.

High birth rates and low death rates made the excess of births over deaths in the farm population 25 percent higher in 1948 than the average for 1930–39, though the farm population was 11 percent smaller. To offset the gain through natural increase would have required a net migration from farms of almost a half million. Actually, the net migration from farms in 1948 was only 140,000; the number of people living on farms increased by 336,000.

The small net migration from farms concealed the fact that many people were involved. Approximately 1.3 million persons moved away from farms, while nearly 1.2 million moved to farms. This movement was not all permanent migration. Possibly half of it may have been seasonal (exact statistics as to seasonal migrants are not available). Many farm-laborer and farm-operator families spend some midwinter months in towns or cities and return to farms in the spring. Quarterly estimates of farm population issued jointly by the Bureau of the Census and the Bureau of Agricultural Economics suggest that around 250,000 youths and single men, or men without their families, move to farms in midsummer but do not stay there in midwinter.

Another type of migration among farm people, the movement from farm to farm, does not affect the total size of the farm population. About 2 million farm people in 1948 moved from one farm to another, in most cases without crossing State lines.

There was little net change in the farm population during 1948 due to the enrollment of farm men in the armed forces and to the return to farms of men discharged from the armed forces.

Slight Regional Gains

Slight gains in farm population occurred during 1948 in all major geographic divisions of the United States except New England and the West South Central States, which had slight losses. The Pacific States had the largest relative increase, nearly 4 percent. The Pacific and New England divisions were the only divisions with more people living on farms in 1949 than in the prewar year of 1940. For the country as a whole, the net decrease in farm population from January 1940 to January 1949 was 8.2 percent. From 1940 to 1945 the farm population decreased by 16.8 percent, but approximately half the loss has been regained.

These estimates are based on census data, sample surveys, and answers to questionnaires. For January 1944 and later dates estimates are adjusted to the level of farm population of the United States, as estimated jointly by the Bureau of the Census and the Bureau of Agricultural Economics. For January 1945, the geographic distribution of the farm population is estimated from the 1945 Census of Agriculture, adjusted to the total level of farm population shown in the Census-BAE series.

For January 1947, the geographic distribution of the farm population is based on BAE's January 1947 Survey of Agriculture, adjusted to the total level of farm population shown in the Census-BAE's series. All other estimates of the farm population of major geographic divisions except those for 1948 and 1949 are interpolations on the basis of mailed questionnaire returns between the 1940, 1945, and 1947 estimates. Estimates by major geographic divisions for 1948 and 1949 are based on questionnaire reports of changes that took place in the farm population during the year.

For years through 1947, estimates were made of the net change in farm population of major geographic divisions due to farm-to-farm migration that crossed division lines. Such migration now constitutes only a small proportion of the total movement. It has not been estimated for 1948.

FEDERAL CROP INSURANCE

Prospects that all farmers will eventually have the opportunity to protect their crop investments against loss from causes beyond their control are brighter today than ever before, although since 1948 the operations of this Department's Federal Crop Insurance Corporation have been on a smaller basis than in other years.

Experience acquired by actual operation of insurance programs that protect the farmer against unavoidable production hazards such as weather, insect infestations, and plant diseases has led the way slowly but surely toward a sound basis for this protection.

A program to give the farmer an opportunity to protect the money and labor he risked against the unknown in order to produce the nation's food and fiber was launched in 1939 on a large experimental scale. Protection of 50 or 75 percent of the individual wheat producer's average production was offered Nation-wide. In 1942 the experiment was enlarged to include cotton crop insurance on a similar basis. The cost of the insurance or the amount by which the indemnities paid to farmers exceeded the premiums they had paid caused Congress to stop the experiment for the 1944 crop year.

However, it was reinstated in 1945 on an even broader scale with flax insurance offered nationally in addition to wheat and cotton insurance and trial programs launched on corn and tobacco. Losses on cotton insurance were heavy in 1945 and 1946. As a result, Congress sharply reduced the scope of the Federal Crop Insurance Corporation's operations for 1948.

The action came just prior to the first favorable year of total operations for the Corporation. Premiums for 1947 exceeded losses by nearly $10,000,000, with wheat, cotton, and flax programs still operating nationally.

The 1947 results, along with three consecutive years in which premiums had exceeded indemnities in wheat insurance, indicated that experience was leading toward a sound basis for crop insurance protection; specifically, toward a basis on which, over a period of years, premiums paid by farmers could be expected to balance with losses paid to producers due to crop disasters from causes beyond their control.

In 1948 the scope of program operations was reduced to 200 counties for wheat, 56 for cotton, 50 for flax, 50 for corn, 35 for tobacco, and 20 for trial programs in other commodities. However, this was another year of favorable experience in crop insurance. Premiums on 1948 crops exceeded indemnities paid by over $5,000,000.

Losses Were Price of Experience

It now appears that losses in the early years of the program were the price of necessary experience. The favorable experience of 1947 and 1948 reflected improvements and refinements made in preceding years on the basis of actual operations. It must be remembered this program was launched in 1939 without any experience to guide it. Under sound operations, crop insurance should build reserves in favorable crop years and pay out losses in excess of premiums in poor crop years. How to do that is beginning to appear.

Major improvements now incorporated in the program include:

1. Protection that increases as the investment in the crop increases but is limited to the cost of producing the crop in an area. The program no longer attempts to protect profit in addition to the actual investment in a crop. Moreover, the stage of production at which the loss is settled now reduces the liability. The original program paid on one level of coverage, regardless of the stage at which the loss occurred.

2. Establishment of coverages and premium rates by areas of similar productivity and risk instead of by individual farms and on a basis whereby actual experience gradually determines the cost of the protection in a county. Methods have been started to reflect, both to counties and to individuals, any favorable experience that results in the accumulation of reserves in excess of those required for sound operations.

3. Steady improvement in loss-adjustment methods and training of adjusters.

4. Continuous contracts under which, at the producer's own decision, the protection continues in effect from year to year without his having to sign an annual application. He is notified of any changes in time to cancel his policy if he does not want to keep it in force.

5. Operation of the program has been shifted from a national to a county basis so that each county in effect operates on a "mutual" basis. Thus the county benefits directly from its good experience, and over a period of years is expected to pay premiums in line with its actual loss experience. Increasing emphasis is being placed on the importance of local administration, including the important change of screening out bad risks—land or individuals.

6. Initiation of a multiple-crop insurance plan. Designed to protect the major portion of a producer's crop investment, this multiple

plan insures several crops under one policy. There is one coverage for all the insured crops, with an offsetting of risk between crops and consequently a sharp reduction in proportionate cost as compared with crop insurance on a single crop. This plan is an important step toward protecting crop investments of all farmers against hazards which they cannot control.

Gradual Expansion Authorized

Congress has authorized gradual expansion of crop insurance to new counties. Starting with 1950 and continuing through 1953, the Federal Crop Insurance Corporation may add to its operations each year 100 new wheat counties, 28 cotton counties, 25 flax counties, 25 corn counties, 17 tobacco counties, and 10 dry edible bean counties. It may increase the multiple-crop insurance plan to 50 counties in 1950 and add 25 new counties to it each year.

Experience has taught many of the lessons needed to develop a program to meet the important problem of stabilizing the farmer's operation in years of crop failure. Experience should continue to strengthen the soundness of crop-insurance operations, while gradually expanding the field of service. Weighed against the progress, the cost has been small.

RURAL HOUSING

Among general provisions for an attack on farm and city housing problems the Housing Act of 1949 (Public, 171, approved July 15, 1949), authorizes loans to help farmers build or repair houses and other farm buildings and also grants to help them in correcting housing conditions that are dangerous to health or safety. The declared objective is to realize "as soon as possible the goal of a decent home and suitable living environment for every American family." Provisions that affect city people authorize loans and subsidies to local authorities for slum clearance and for the construction of 810,000 new dwelling units for low-income families. The amount authorized for the first year in a 4-year rural program is $25,000,000. Altogether, for the entire 4-year period, the legislation authorizes $275,000,000 in loans and grants for rural programs. About 13,000 farmers will receive housing aid the first year, while in the entire 4-year period 135,000 farmers will receive such aid.

The law authorizes some funds for research. This will deal with such problems as the improvement of designs for houses both urban and rural, and with ways to reduce building costs. Under previous arrangements some work of this type is under way in the Department of Agriculture and in the State agricultural experiment stations. In addition, the new legislation enables the Secretary of Agriculture to provide farmers with building plans, with information on farm dwellings and other buildings, and with construction-supervision and inspection. This will facilitate expansion of a program now operated through the extension services. Under the law the services mentioned can be provided with or without charge to the farmers.

In order to be eligible for loans under the Housing Acts, farmers must lack the money necessary to finance building or repair work

themselves, and must be unable to get credit on terms they could be expected to fulfill. Farms as defined for the purposes of the act are parcels of land operated as single units which average or are capable of averaging at least $400 of production annually at 1944 prices. Farmers in Alaska, Hawaii, Puerto Rico, and the Virgin Islands will benefit from the legislation, as well as farmers in the United States. Only farm owners are eligible for housing loans or grants; but owners may obtain loans to improve housing for their tenants, lessees, sharecroppers, and laborers. If a farmer who applies for a loan seems likely to have enough income from his farm or from other sources to pay off the loan, the advance may be for the full cost of the improvement. Frequently, the security will be a second mortgage.

Aid for Low-Income Farmers

Under certain conditions farmers whose expected income is not sufficient to provide payments of interest and principal may qualify for help. Such farmers must agree to change their farming operations or do other things likely to increase their incomes and enable them to pay off building or repair loans. Changes or improvements suggested under this provision of the law must be completed within 5 years. If that has been done, and the borrowers are still not able out of their incomes to make the scheduled payments, the Government may write off half the principal and all the interest. If the inability of a farmer to pay off a housing loan is attributable to the smallness of his farm, loans may be made to him for the purchase of additional land. There is also a provision in the act for farmers who cannot hope to qualify for construction or repair loans. Farmers with no prospect of sufficient income to repay loans may apply for grants up to $500. Such grants may be used to repair roofs and to provide screens, sanitary water supplies, and toilet facilities. Occasionally, loans and grants may be combined up to a total of not more than $1,000.

Loans under the act may not run for more than 33 years and the rate of interest may not exceed 4 percent. Under certain conditions, such as in cases of extreme hardship or when circumstances prevent a borrower from meeting his payments, the Government may grant a moratorium as to both principal and interest. While the Housing Act does not limit the amount a farmer may borrow under it for housing or other buildings, the Farmers Home Administration estimates the loans will average about $2,200, in most cases for remodeling rather than for completely new construction. Most of the borrowers probably will be farmers with sufficient income to pay off loans, without further assistance from the Government. The Farmers Home Administration is receiving applications for loans and grants.

Meantime, the Bureau of Agricultural Economics is making surveys of rural housing needs and other agencies of the Department are doing research on materials, construction methods, the design of farmhouses, and rural construction costs. As soon as possible the results of this research will be made available to farmers. It is evident from the 1940 census that many farm homes are not up to standard as decent, safe, and sanitary dwellings. In fact, the census indicated that from 2½ to 3 million farmhouses were below that standard.

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Also, the Bureau of the Census reported that 16 percent of the country's farmhouses were overcrowded, 68 percent lacked electric lighting, 72 percent lacked running water, 89 percent lacked a private flush toilet, and 88 percent lacked a private bath. By contrast, the situation in cities was vastly better. Only 6 percent of the city homes were overcrowded, only 4 percent lacked electric lighting, only 6 percent lacked running water, only 17 percent lacked a private flush toilet, and only 22 percent lacked a private bath.

Improvement Since 1940

Nevertheless, the rural housing situation has improved since 1940. A survey taken by BAE in 1947 indicated that nearly one-fourth of the farmers interviewed were doing some building or repair work on their dwellings. Nevertheless, farmers likely to apply for assistance under the new Housing Act in most cases have not been able to do much. Low farm incomes, shortages of labor, materials, and equipment, and high costs have stood in the way. In 1947, according to the survey just mentioned, more than two-thirds of the country's farmhouses still lacked running water; four-fifths lacked a bath and a flush toilet; two-fifths lacked electric lights; and one-tenth lacked room enough for their occupants. Another survey, if taken as of now, would show some further improvement but also a continuing great lack of adequate rural housing.

SCHOOL LUNCHES

Out of a total school population of approximately 26 million pupils, some 7 million—slightly more than a fourth of them—are now benefiting from nutritionally balanced noonday lunches provided through the National School Lunch Program.

This program has been in operation since 1935, when it was authorized by the Seventy-Fourth Congress. The purpose of the program, then as now, was to provide new outlets for agricultural commodities, and to improve the nutritional standards of young children.

The program was operated on a year-to-year basis until 1946, when Congress placed it on a permanent basis with the passage of the National School Lunch Act. It is now operated on a grant-in-aid basis, and States are required to match Federal funds dollar-for-dollar. Actually, the State contribution is greater than the Federal appropriation, exceeding it by a ratio of about 3 to 1. Also, greater administrative authority is vested in the States and communities where the program is operated.

The School Lunch Act of 1946 authorizes the following types of Federal assistance to the program:

1. Cash reimbursement for a part of the school's expenditure for purchases of food from local sources.

2. Foods of special nutritive value which are purchased economically in large quantities by the Department of Agriculture and distributed to participating schools in accordance with need. During the 1948–49 school year, these foods included processed cheddar cheese, nonfat dry milk, canned tomatoes and tomato paste, concentrated orange juice, and peanut butter.

3. A part of the foods purchased by the Department of Agriculture under its surplus removal operations. These foods may be distributed to all schools serving lunches on a nonprofit basis, regardless of whether they participate in the reimbursement plan.

4. Funds to assist in the purchase of equipment for preparing and serving school lunches. Funds for this purpose have not been appropriated, however, since the first year of operation under the act.

Public and nonprofit private schools may apply for Federal aid through their State educational agencies. Participating schools must agree to comply with minimum nutritional requirements in the preparation and serving of meals, as established by the Department of Agriculture. The program must be operated on a nonprofit basis, and schools must purchase, insofar as practicable, foods which are designated by the Department of Agriculture as being in national or local abundance. Lunches must be made available to all children without discrimination and served free or at reduced cost to those unable to pay the full cost.

Lunch Program a Community Project

The establishment and operation of a school lunch program is a community project. Parents, teachers, civic, or other organizations contribute by providing facilities, equipment, and food, and by raising funds. Even school children help, and many lunches are served on tables built by pupils.

Congress has appropriated $83,500,000 as the Federal contribution for the School Lunch Program during the 1949–50 school year. About three times this amount will be provided from sources within the States. In addition, the United States Department of Agriculture will donate a substantial volume of food commodities acquired under surplus removal programs. Local groups and individuals also will contribute foods and services to assure success of the program.

This all means that about 1¼ billion nourishing lunches will be served to approximately a fourth of the Nation's school children during the coming year. Production and Marketing Administration officials, who guide the operations of the program at the national level, estimate that this year's program from the standpoint of value of food distributed will considerably exceed last year's.

TRADING ON COMMODITY EXCHANGES

Futures trading in agricultural commodities supervised by the Commodity Exchange Authority continued in large volume. Speculative activity in some commodities, particularly wheat and cotton, declined from the relatively high levels of the previous year. Trading increased in other commodities, however. The volume in soybeans and lard was the largest on record.

The requirements for day-to-day enforcement of the Commodity Exchange Act remained above normal. Investigations and compliance activities dealt with the operations of traders charged with price manipulation and market corners, cheating and fraud in the execution of futures transactions, bucketing, false record-keeping, and other violations.

Surveys were made on selected dates of all futures accounts in wheat, corn, and soybeans on the Chicago Board of Trade, in cottonseed oil on the New York Produce Exchange, and in the wool top market of the Wool Associates of the New York Cotton Exchange. The results of special trade practice surveys on the New York and New Orleans cotton exchanges—the first such investigations since 1942—showed inadequate record-keeping and various types of noncompetitive transactions. The exchanges are cooperating in corrective programs based on their own rule-making powers. The results will be evaluated by further surveillance.

The survey of accounts on the Chicago Board of Trade covered the grain price break of February 8 and 9, 1949. Prior to the break, declining prices had resulted in accrued losses for many long speculators, with attendant depletion of margins.

The CEA survey, covering wheat, corn, and soybeans, showed that a majority of the speculative accounts with net market positions were long on the eve of the price break. On February 8 and 9, the holdings of more than one-fourth of these net long speculators were liquidated completely, and the holdings of a large additional number were liquidated in part. This "washout" of speculative longs, plus new short selling by other speculators, widened and deepened the 2-day price decline, during which wheat futures dropped 18 to 19 cents a bushel at the low point, corn 14 cents, and soybeans 20 cents.

A survey and report on cottonseed oil futures showed that the market was not used extensively for hedging purposes by many segments of the cottonseed-oil industry. Rules of the market provide for delivery of only one grade of refined oil. In the spring and summer of 1948, when cottonseed oil was exceedingly scarce and large processors attempted to use the futures market as a minor source of supply, their operations tended to maximize price fluctuations. The CEA recommended that consideration be given to broadening the cottonseed-oil futures contract as a means toward greater price stability and more serviceable price protection for a larger part of the industry.

Basic Study Completed

After a period of interruption due to the war, the CEA completed a long-needed basic study of certain aspects of speculative trading in grain futures. The study analyzes original data on the futures operations of nearly 9,000 traders, covering more than 400,000 futures transactions. It provides information for the first time on the actual profits and losses of a large body of speculators, and throws much new light on the characteristics of speculative trading.

In the 13 years since the Commodity Exchange Act amendments of 1936 were enacted, experience has shown the need for strengthening the legislation in several important respects. Bills to amend the act were introduced in both houses of Congress during the year. These are bills H. R. 4685 and S. 1751. They would extend regulation to futures trading in 11 agricultural commodities not now under the act. The Secretary of Agriculture would be empowered to fix minimum margin requirements on speculative transactions in commodity futures and to designate additional delivery points for contract mar-

kets as needed. Another proposed amendment would require the registration and provide for the regulation of commodity trading advisers and commodity pool operators. The proposed amendments would increase the affectiveness of market regulation.

PROGRESS UNDER RESEARCH AND MARKETING ACT

In several important ways the Research and Marketing Act differs from previous agricultural research legislation. For example, RMA for the first time gives the Department authority to contract with qualified public or private agencies to conduct research in marketing and in finding new uses for agricultural products. Also, on a fund-matching basis, it allows the Department for the first time to enter into cooperative agreements with State departments of agriculture and bureaus of markets to do marketing-service types of work.

Furthermore, the act greatly increases the amount of marketing research that can be done and aims to cover all phases of distribution and marketing.

Not less than 20 percent of the direct-grant funds to State experiment stations must be applied to marketing research. Up to 25 percent of the direct-grant funds may be used for regional research as recommended by a committee representing the experiment stations.

A national advisory committee representing agriculture and industry consults quarterly with the Secretary of Agriculture and other USDA officials about research under the act. Commodity and functional committees may be formed and 20 such committees are now active.

Actual research and service work under the RMA is carried on or is under the direction of the Department of Agriculture and of State agricultural agencies.

In 1948 and 1949 a foundation was laid strong enough to carry an expanding program. Through 1951 the act authorizes a total sum of 61 million dollars. In addition to a National Advisory Committee and a Committee of Nine representing the State agricultural experiment stations and the commodity and functional committees authorized under title III of the act, several other committees were appointed to represent State agencies under the legislation. These included an Experiment Station Marketing Research Advisory Committee, an Extension Committee on Marketing, and an Advisory Subcommittee on Cooperative Work under the RMA with State Departments of Agriculture. These committees assist the Department in establishing procedures and in formulating programs.

The total of RMA funds appropriated for 1949 was $13,850,000 as compared with $9,000,000 for 1948. The break-down showed a trend toward more marketing research and service work:

	1948	*1949*
Direct-grants to the States (sec. 9)	$2,500,000	$3,250,000
New and wider uses of farm products (10a)	3,000,000	3,900,000
Other than utilization in cooperation with State experiment stations (10a)	1,500,000	1,950,000
Marketing research and services (title II)	2,000,000	4,750,000

Altogether, the figures for 1949 showed an increase over 1948 of about 54 percent. For marketing research and services, the figure for 1949 was well over twice as much as for the previous year. This seemed to indicate increased interest by the Congress in agriculture's marketing problems. Concern about the possibility of surpluses was greater. There was also more emphasis on efficiency in marketing as a means of preventing waste and encouraging low-cost distribution.

Some Typical Results

Examples of useful results can be given. During and since the war, egg shipments by rail have been loaded 10 to 20 percent heavier than prewar. This kind of loading has been blamed by the egg trade and by railroad men for a tremendous increase in damage to shell-egg shipments. Tentative findings indicate, however, that a major part of this damage results from irregular and inadequate methods of loading the additional cases into the car, rather than from the heavier loading as such.

Twenty-one State experiment stations and the USDA have made substantial progress toward determining the quality of eggs delivered by farmers to first receivers and toward measuring the subsequent change in quality from that point to the next receiver. They are also measuring the influence of various things that have to do with the quality of eggs delivered by producers; finally they are determining the extent, manner, and causes of physical and quality loss to shell eggs as a result of handling, transporting, storing, and distributing between carlot assembly points and destination.

Another RMA study, aimed at developing or improving equipment for rural processing plants, has already produced highly satisfactory results. USDA engineers cooperating with the University of Georgia have altered and adapted a machine for shelling peas and beans that satisfactorily handles from 200 to 300 pounds of pods an hour. By hand, it takes an hour for a person to shell 10 pounds. A manufacturer is now producing this machine in quantity.

The goal of a comprehensive RMA project is to measure current costs and margins in the marketing of farm products and to analyze factors affecting them in order to provide a basis for suggesting ways and means of increasing efficiency in marketing and reducing the price spread between producer and consumer.

Costs-and-margin studies are being made on a number of commodities; several have been completed. One study had to do with the costs of marketing South Carolina-grown tomatoes in the New York area. It showed that South Carolina tomato growers in June 1948 got 31.3 cents of the consumer's dollar spent for these tomatoes in New York. Marketing charges accounted for the other 68.7 cents of the dollar, of which 12.4 cents went for grading, packing, and assembly; 8.9 cents went for intermarket transportation; and 8.1 cents for cost of first sale. The combined retail and wholesale margin was 39.3 cents. A significant sidelight was the discovery that about 8 pounds out of every 30-pound lug represented waste and spoilage from decay, cracks, insect damage, and bruises. These defects were found to be costly in the ripening and repacking of green-ripe South Carolina tomatoes.

Another project has to do with the development of new and revised standards for grades of processed fruits and vegetables. On the basis of data obtained under this project, the grades for green and wax beans, fruit jam and preserves, and cucumber pickles have been revised and officially published. Similar data have been obtained for new standards for grades of canned field peas, blackeye peas, and white potatoes. The necessary basic information has been collected for revising the standards for maple sirup, canned asparagus, blueberries, red sour pitted cherries, okra, spinach, and certain items of frozen produce. Honey, canned plums, pineapple, pineapple juice, apple juice, grape juice, and carrots are other items on which data are being collected with a view to revising the grade standards.

Contamination of Processed Fruits

Entomologists are trying to find out how to prevent contamination of processed fruits and vegetables by insects and insect debris. First efforts in this research are aimed at developing methods for removing the European corn borer from sweet corn at the cannery; at methods for removing such insects as aphids and caterpillars from broccoli, spinach, and other leafy vegetables; at preventing contamination of canned peaches and tomatoes in Colorado by vinegar gnats and the contamination of canned blackeye peas in the South with cowpea curculio.

Another phase of this work aims to determine the amount of residue remaining on fruits and vegetables at harvest time following the use of various insecticides and formulations of them in the control of insects on growing crops. Studies are under way to develop methods of protecting flour, meal, and cereal products from insect infestation through better sanitation and the use of insecticides.

Better ways have been developed to prevent insect damage to stored grains, cereal products, and seed stocks. A chemical treatment successfully keeps insects from entering cotton bags. The effectiveness of the treatment was tested by exposing both treated and untreated bags containing insect-free flour in a heavily populated insect-testing room. In one such test, no insects at all got into the bag made of treated cloth during 7 months, while 563 insects got into the untreated bag. The treatment shows high promise of protection against such insects as flour beetles, the cadelle, Mediterranean flour moth, the lesser grain borer, and several others that cause trouble in stored cereal products.

Studies of Packaging

Work is being done to improve the packaging of dry beans, peas, and rice. The immediate objective is to learn more about the present types and sizes of containers or packages with a view to discovering improvements that will reduce wastes in handling, shipping, and storage. Problems which the study will attempt to overcome include shelf breakage, color deterioration, insect infestation, and mold caused by excessive moisture and heat.

Considerable variation occurs in the size of containers for dry beans, peas, and rice, particularly in the less-than-1-pound packages. Housewives have expressed some dissatisfaction with purchases of twelve 14-

and 15-ounce containers which they bought under the assumption they were getting 1 pound. A similar situation exists in connection with 1½-pound versus 2-pound packs. Elimination of some of these intermediate-sized packages might result in reduced costs to packagers, lower overhead and inventory investment for wholesalers and retailers, and greater satisfaction to consumers.

Outlets for Dairy Products

The Federal Extension Service in cooperation with the Extension Service of more than 30 States has begun educational and demonstration programs in marketing emphasis on many aspects of dairying. In Wisconsin the work aims at expanding market outlets for dry milk. It includes demonstrations on the use of nonfat milk solids by institutions, industrial plants, and tourist areas. In Missouri the work helps farmers to maintain quality in milk so as to meet requirements for the whole milk trade. In New Mexico it distributes information through farmers' meetings, in the press and by radio, as to the proper care and handling of milk and cream. Actual tests demonstrate among other things the merits of using improved equipment. The program emphasizes benefits in terms of farm income. Another phase of the work concerns the demand for abundant foods, new uses for such foods, and promotes more effective utilization of them, particularly for better diets.

Research in the Department developed a process for using cheese whey in sherbets as the sole source of milk solids. It demonstrated that the natural acidity in cottage cheese whey replaced the expensive citric or lactic acid usually added to sherbets, and that the typical whey flavor could be offset by adding certain fruit flavors. Whey sherbet produced in this way has good physical composition and high nutritive value. The results indicate that a new use for cottage cheese whey can be developed.

Another phase of the study revealed that high-grade buttermilk solids, in solid or dry form, can replace skim-milk solids in ice cream; in fact mixes made with buttermilk solids showed better whipping properties than the ordinary mixes. Experiments on the use of dairy products in bakery goods disclosed that sweetened condensed whey can replace up to 50 percent of the egg albumen normally used in yellow layer cake and in brownies. Another investigation endeavors to develop new methods for removing water from skim milk, whey, and buttermilk. The researchers are trying to find more efficient uses for protein from whey, such as might help to solve the whey disposal problem at milk plants. Methods already developed can remove approximately 60 percent of this constituent. A process tried for using whey protein as a food produces a very palatable product with a Roquefort-like flavor.

Why milk and cream deteriorate when frozen or refrigerated is the subject of an intensive investigation. If the investigation develops ways to retain freshness for a longer time, the consumption will undoubtedly increase. In addition it will be easier to preserve these dairy products from periods of flush to periods of low production. Data have been obtained from milk handling and processing plants in

North Carolina and Texas regarding seasonality of receipts, usage, prices, and other related factors. Data for 1947 have been compared with those of the prewar period. Records obtained from dairymen indicate some of the reasons for the current seasonality pattern, and throw light on the problems involved in changing it. A similar study has been made regarding the Boston milkshed.

Another project seeks to determine what effect the practice of selling butter and cheese in accordance with central-market quotations has on producers' returns and on marketing margins. The Farm Credit Administration in cooperation with the Iowa Experiment Station, conducted the investigation in principal butter and cheese-producing States and on exchanges that handle butter and cheese in important central markets.

The function of cooperatives in the development of fluid-milk pricing plans and methods of use classification is being studied. One phase of this study has to do with the role cooperatives might play in developing pricing plans to encourage more uniform seasonal production. Another phase will concern the role of cooperatives under Federal milk-marketing orders.

Reactions of Livestock to Heat and Humidity

Studies are under way to determine the physiological reactions of dairy cattle to high temperatures and humidity in the South. Red Sindhi bulls are being crossed with Jersey cows at Beltsville, Md., and Jeannerette, La. At College Station, Tex., a group of Brahman females are being brought together to be bred to Jersey bulls. Crossbreds of various combinations of straight dairy breeds, along with Brown Swiss and Guernseys are to be studied at Clemson, S. C. Progress is being made toward the development of strains of dairy cattle that will help small dairymen to get higher milk production per cow. The project aims to develop systems of breeding that will concentrate genetic factors for high milk production; find better ways of proving more sires; furnish the desired proof in a shorter time than is now possible; and more accurately predict the value of young bulls.

In cooperation with the Dairy Department of the University of Maryland, the Department is trying to learn to what extent the lack of nutrients in forage affects milk production. Analyses are being made of digestion trials which ran for 3 months on alfalfa harvested as wilted silage, field-cured hay, and barn-cured hay. Further digestion trials will appraise oat hay harvested at different stages of maturity.

Many marketing problems cannot be solved in a laboratory or other facilities of the Government. They must be studied in the distribution system itself. For this purpose the Department may enter into cooperative agreements or contracts with other branches of the Government and with State agencies, trade associations, private organizations, or individuals. This is permissible when the Secretary of Agriculture determines that the work can be done in that way more effectively, in less time, or at less cost than otherwise. In the fiscal year 1949, 40 new contracts were entered into and 12 amendments were made in 1948 contracts involving a total of approximately 1 million

dollars. These contracts covered work both in marketing and in utilization. Twenty-eight cooperative agreements are in effect with State agencies.

Research as to Marketing Costs

One reason why marketing costs are so high is inefficient and in many cases unnecessary handling of farm products in market places, warehouses, railroad cars, and trucks. Studies were undertaken last year to determine how these handling costs might be reduced. Means suggested included the use of various kinds of labor-saving machinery, such as two- and four-wheel hand trucks, skids or pallets with lift trucks, and conveyors used alone or in combination with other equipment. The investigations try to determine under what conditions it will pay to use such equipment. Efficiency tests have been made on the handling of bushel baskets of apples and peaches, 50-pound bags of cabbage, standard boxes of citrus fruits, 100-pound bags of potatoes, bushel hampers of beans or peas, crates of lettuce, lugs of tomatoes or grapes, and certain other items.

Lack of adequate marketing facilities adds considerably to marketing costs. A project initiated in 1948 aims to develop plans for the construction of improved facilities in production areas and at terminal and secondary markets. By July 1, 1949, the work was completed or well along in 25 cities and in designated production areas in 17 States. It benefited from the cooperation of farm and trade groups, railroads, warehousemen, civic organizations, city officials, and State agencies.

Studies in given markets considered the kind and size of facilities needed, the best location for them, what they would cost, how they should be managed and operated, what rentals would have to be charged for their use, how they might be financed, what savings would result from operating them as compared with the costs of operating existing facilities, and what benefits could be expected to accrue from them to producers, distributors, consumers, and the general public.

Closely following the Department's proposals, a million-dollar market has been built and is in operation at Jackson, Miss. It serves that city and the entire central part of the State. Plans have been completed for a new market at Hartford, Conn. A new farmers' market has been built and is in operation at Trenton, N. J. A new market is under construction at Greenville, S. C. In such instances non-Federal funds are used to buy the land and to finance actual construction. RMA funds are used only for the planning and promotion phases of the work.

Railroad rates for transporting potatoes were approximately twice as high in 1948 as in 1913. An analysis of the relationship between railroad transportation charges and price margins between shipping points and the wholesale price showed in general that about 96 percent of the variation in shipping-point wholesale margin was associated with variations in railroad transportation charges. Another part of this study will deal with the mode of transporting farm products from the farm. It will show among other things how much of the truck and trailer equipment is owned by the farmer and how much by other owners.

Condition of Products at Retail

A study in 1948 dealt with the condition of both Eastern and Western apples as offered for sale in retail stores. It showed that as much as 23 percent of the original weight had to be cut away because of bruises and that as high as 30 percent had to be discarded because of storage rots. Further study will help to determine how much of the loss is due to handling in the retail store and to other handling.

A study on the refrigeration of prepackaged fresh vegetables showed that if such vegetables are held at 42° F. during marketing operations they will keep from two to three times longer than they would otherwise. The tests covered broccoli, brussels sprouts, and cauliflower wrapped in various types of transparent film. None of the vegetables in a lot that had been kept at 67° F. were salable after 4 days. In another lot, kept at 42°, the cauliflower retained good color and flavor for 8 days and the sprouts and broccoli stayed in good, salable condition for 11 days. Some plastic wrappings were better than others; but all of the kinds used in these tests helped preserve quality. The nonwrapped vegetables deteriorated rapidly. Work along this line is continuing.

Plant physiologists discovered a new and quicker method for precooling grapes, by using specially designed tunnels to precool the grapes to suitable temperatures in 1 hour. By this method West coast growers may cut the shipping time from harvest to market by 14 to 24 hours.

In a study of decay and spoilage of fruits and vegetables in transport from grower to market, more than a thousand different chemicals were tested for control of stem-end rot. Tests at Orlando, Fla., indicated that about a dozen of these chemicals may help solve the stem-end rot problem. At Beltsville, Md., and Chicago, taxonomic studies are in progress on bacteria isolated from soft rots of potatoes, carrots, spinach, and certain other vegetables.

Marketing Projects in PMA

Research and marketing service work has broadened in the Production and Marketing Administration under the impetus of the Research and Marketing Act of 1946. It includes fundamental studies as well as projects undertaken to solve particular problems quickly. Marketing research projects in PMA during 1949 involved 11 of its branches, usually in a cooperative relationship with research people in other agencies of the Department and in the State agricultural experiment stations.

A study of egg quality during marketing covered 12 North Central States and Kentucky. In this region 1 egg out of every 3 inspected was below grade "A" when the farmer sold them. Within 2 days after the farmer sold the eggs, an average of more than a dozen out of each 100 sold had deteriorated further by one grade. Eggs often are in the channels of trade for 2 to 3 weeks; the delay results in large economic loss. Emphasizing findings as to the extent to which loss of quality in eggs commonly reflects the length of time eggs remain in trade channels and the temperatures at which they are held, the investigators urged producers and handlers to keep eggs moving and keep

them cool. Eggs decline in quality between the time they are laid and the time the farmer sells them. Studies are under way to discover how this decline may be lessened.

Relatively low egg prices to producers often coincide with relatively high prices to consumers for high-quality eggs. This paradox received attention in the study. Recently the large total supply of eggs necessitated Government purchases, yet the supply of eggs of "A" quality for breakfast use has been relatively short. Knowledge of the causes should indicate remedies.

Heavy crops of potatoes and the presence of low-grade potatoes in trade channels present a problem. Facts gathered in experiments in the feeding of small and low-grade potatoes to livestock showed that if transportation costs are not high inferior potatoes may be fed profitably to dairy cows, beef cattle, hogs, and sheep. Use of such potatoes as part of the ration often brings greater gains in weight or in milk production than those shown by animals kept on the regular ration. Moreover, the use of small and low-grade potatoes as feed keeps such potatoes off the food market, and makes more room there for the better grades.

Still another project inculcated better practices in retailing fresh fruits and vegetables. One-day training courses, conducted Nationwide through contract, gave instruction to retailers and their employees in 69 cities and 29 States. More than 12,000 persons attended the classes which gave advice on how to prepare, display, care for, and merchandise fresh fruits and vegetables so as to reduce spoilage and maintain quality. The classes stressed the good effects of better merchandising methods on sales. Many of the retailers who took this training adopted the practices recommended as shown in a subsequent survey. Thus the recommended trimming practices were adopted by 98 percent of those who had not previously used them; slightly over 89 percent reported adopting color contrasts in displaying fresh fruits and vegetables; almost 87 percent reported adopting the practice of watering display produce; slightly over 75 percent adopted the selective display technique; and more than 45 percent reported making improvements in their equipment.

Marketing Service Program

PMA cooperated with 23 State departments of agriculture and bureaus of markets in a marketing service program with three general objectives: (1) To provide basic information on supplies and markets; (2) to expand outlets for farm products; and (3) to improve the efficiency of marketing agencies.

State departments of agriculture, with the cooperation of PMA, helped producers to determine the best time to harvest fruits and vegetables, to prepare them suitably, and to locate outlets not too heavily supplied. Another project helped cotton ginners to select suitable machinery. Improved gins produced ginned cotton that averaged higher in grade than cotton ginned in plants with old-style equipment. In a grain State, tests were made to determine the types, quality, and probable quantity of wheat likely to be harvested in each county. This information helped farmers in seeking premiums for

high-grade grain, and helped millers in getting the kinds and qualities of wheat they needed.

Tomato growers obtained help in the preparation of their crop for marketing. The result was a sharp rise in the quality of tomatoes marketed in a producing area. Within a few days, the proportion of the crop that graded No. 1 rose from 25 percent to 65 percent of the offerings. Prices obtained for the improved product ran as high as $1 per half bushel basket above the prices received for lower grades.

Much space would be necessary to list PMA's marketing studies; they cover agricultural distribution from packaging and shipping through transportation and processing to retail sale. Important projects deal with the feasibility of marketing sweet corn in consumer-size containers prepacked at the point of production; with marketing problems in particular areas such as the western Texas potato growing area and the tri-State (Tennessee-North Carolina-Virginia) snap bean producing area; with opportunities for developing a larger market for tree nuts among industrial users such as bakers and confectioners; with determination of the kinds of cotton fiber best suited to particular uses; with the production, storing, and processing of oilseeds; with marketing costs and margins; with problems involved in shipping eggs for table use or for hatching; and with ways to expand markets for milk and other dairy products. Results come to the attention of farmers and others through the Agricultural Extension Service and in other ways, and often quickly influence production and marketing.

MARKET STUDIES AND MARKET NEWS

Handling and carting fresh produce from the limits of large cities to the consumer's shopping bag often costs as much as it does to produce and bring the products to the city limits. Expense in distributing products is unavoidable. Studies of marketing facilities show, however, that most markets are outmoded and inefficient. This condition contributes greatly and unnecessarily to the cost of marketing. In most markets facilities could be arranged in such a way as to reduce marketing costs substantially. The savings could be passed in part back to producers, in the form of higher farm or assembly market prices.

Studies of wholesale produce markets by this Department in 1949 revealed widespread basic defects. Buildings used for wholesale stores were often not designed for that purpose. Stores generally lacked rail connections; with the result that produce brought in by rail had to be loaded into a truck and taken to stores for unloading, a costly double handling. Most stores were without loading platforms; it was necessary to lift produce down to the sidewalk or up to the truck. This handling involved unnecessary costs, paid for at least in part by the producers. In most of the markets studied by the Department, trading was handicapped by narrow streets and lack of parking space. According to its regular policy, the Department made these studies only upon request.

On the basis of the findings, the Department recommended changes calculated to reduce the cost and amount of produce handling.

Features of all changes proposed by the Department included adequate rail connections, wide market streets, loading platforms for stores, and front and rear entrances for stores. Market studies by USDA were under way during the year in some 30 cities. In Greenville, S. C., in line with recommendations made previously, a new market began operation; new wholesale stores were opened in Miami, Fla. Land was prepared for a new market in Hartford, Conn.; and construction of new markets, was in early prospect in St. Louis, Mo., and Milwaukee, Wis.

In virtually every market studied the Department concluded that thoroughly modern facilities would pay for themselves and leave savings that could be passed back in part to producers.

USDA Market News

This year was the thirty-fifth of the market news service, and the anniversary was a reminder that the need for timely market information on farm products grew out of basic agricultural changes. Growth of urban industries shifted population to the cities. Simultaneously, farming shifted from a largely self-sufficing occupation to production principally for sale. Railroads and motortrucks opened up new markets and encouraged regional specialization of farm production.

With markets farther away from producing areas, however, marketing of farm products became more complex and costly. To lessen this disadvantage, dealers developed their own sources of information. Private agencies were established to supply market information. These agencies operated in a limited way and supplied reports only to their subscribers. Cost of this service was too high for most producers; they were consequently at a disadvantage. Over the years it became apparent that producers and traders in general could get comprehensive and dependable information only through an unbiased public agency.

In consequence, establishment of marketing news work was provided for in the Department of Agriculture originally in the Agriculture Appropriation Act of 1914. The first USDA market report was issued on March 27, 1915, at Hammond, La. It reported the movement and prices of strawberries. In 1916 studies were made on reporting of market information for livestock and meat, dairy and poultry products, grain, seed, and hay. Services on these commodities were started by the USDA in 1917 and 1918. Market news for cotton started in 1949 under an amendment to the Cotton Futures Act. In 1937 the Smith-Doxey Act provided for the free classing of cotton to members of cotton improvement groups, and at the same time for the collection and dissemination of additional cotton market news. The Agricultural Appropriation Act for the fiscal year 1932 authorized collection and distribution of market news for tobacco.

In 1935 the Tobacco Inspection Act provided for a market news service on any market where two-thirds of the growers voted in a referendum for compulsory tobacco inspection. Altogether, USDA's market news service now covers more than 100 agricultural products.

The first telegraphed market reports were sent by USDA in code over commercial wire. In 1917 the Department made arrangements

to lease wire circuits for use in sending and receiving its market reports. By leased wire the Department was able to issue considerably more market information than dealers were able to obtain by themselves. Approximately 70 market news offices are now connected by about 10,000 miles of leased wire, operated through eight circuits, each of which serves a section of the country. Radio broadcast of USDA market news began on December 15, 1920, over the radio station of the United States Bureau of Standards. Today more than 1,100 radio stations broadcast market news regularly.

Dissemination of Market Reports

Approximately 1,200 daily newspapers carry market news information collected by the Department. Approximately 2,000 weekly and farm papers frequently carry market news reviews and special articles of local interest based on USDA market news reports. These newspaper reports come to the publishers directly from USDA market news offices or via the Associated Press, United Press, International News Service, and Trans Radio. Market news releases of local interest are posted on bulletin boards in stockyards, cotton gins, shipping sheds, tobacco warehouses, post offices, country stores, or banks. Federal-State agreements make possible a greatly expanded market news service, as compared with that which could be provided by the Federal market news services alone. Some 44 agreements in effect with 37 States tend to reduce duplication of effort and at the same time expand the market news coverage.

ECONOMIC RESEARCH AND SERVICE

The Bureau of Agricultural Economics, as it is today, is the outgrowth of needs expressed by the American people throughout somewhat more than a century. Some of these needs were for information that would help individuals do a better job of managing their farms, their household affairs, or their private business. There were needs, too, for information that would help the Nation in its conduct of the public business in war and in peace.

It is always difficult to give an exact date when any line of work was started, and it is especially difficult to trace the development of the various branches of agricultural economics and statistics. However, certain dates and events stand out.

In the 1830's, farm leaders first began to express the need for reliable statistics that would help farmers produce what was wanted, and sell their products without loss arising from false rumors or ignorance of the volume of competing supplies. In 1839, Congress authorized the Patent Office, then in the Department of State, to use $1,000 for agricultural purposes, including the collection of statistics. In 1862, the needs of a Nation at war led to the establishment of a Department of Agriculture—and one of the Secretary's duties was to collect statistics.

Although farm management studies started in the Bureau of Plant Industry in 1902, the Bureau of Statistics, established in 1903, joined with it in studies of the cost per acre of producing farm crops. The Bureau of Statistics soon became interested in many lines of work

closely related to present-day activities of the Bureau of Agricultural Economics. By 1907–8 it was probing into such subjects as farmers' cooperative organizations for fire insurance; production and consumption of wheat; a chronological record of progress and improvement in the agriculture of the United States; changes in farm values and the causes thereof; and transportation of farm products. In 1909–10, the Bureau of Statistics worked out a crude forerunner of parity, in response to urban complaints about the high cost of living. It measured the average retail prices of 85 staple commodities bought by farmers in 1899 and 1909, and concluded that the average purchasing power per acre of 10 major crops had risen 50 percent in the decade.

Evolution of Economic Services

An Office of Markets and a Rural Organization Service were established in 1913. And in 1919, a reorganized Office of Farm Management undertook work in cost of production, farm organization, farm financial relations, farm labor, agricultural history and geography, land economics (including land ownership and tenancy), and farm life studies.

After successive reorganizations and combinations of these various agencies, they were all merged in 1922 into a new Bureau of Agricultural Economics. A postwar depression led directly to the establishment of this Bureau, to help agriculture find its way out of bankruptcy. The same needs led in 1923 to the start of a continuous outlook program (outlook reports had been published as early as 1913) and to an annual report on farmers' intentions to plant. Both of these activities were designed to help farmers make their own adjustments between supply and demand.

Facts and figures supplied by the Bureau of Agricultural Economics and its predecessors have influenced the conduct of wars and of recovery programs. Establishment of these programs has been directed by Congress, and carried out in most instances by the President and the Secretary of Agriculture, in response to public demands.

This agency did much of the collection and analysis of data that led to the establishment of the whole farm-credit structure now administered through the Farm Credit Administration. Similarly, it supplied data and analysis incident to the establishment of the Federal Crop Insurance Corporation, and continues from time to time to supply data not only to this Corporation but also to the Farmers Home Administration, the Commodity Credit Corporation, and other agencies of the agricultural adjustment, marketing agreement, surplus commodities, and price support programs. It developed the parity price and parity income indexes used to measure changes in the buying power of farm products and the relative changes between farm and nonfarm income per capita.

Economists have helped in the establishment of farmers' mutual fire insurance companies (there are now more than 1,800 companies with more than 16 billion dollars worth of insurance in force). They have developed types of individual farm plans used by the Soil Conservation Service and by the Farmers' Home Administration in their programs, as well as by thousands of farmers. They have developed

an improved farm lease, which has saved time and trouble for many a tenant and landlord, and at the same time enhanced farm efficiency. The BAE has mapped type-of-farming regions, and done sociological research for the Extension Service and other agencies. It has recorded what happened to farm-mortgage debt, to interest rates, and to farm-land values after World War I. This knowledge has helped many a farmer and many a banker avoid mistakes since World War II.

Pioneer for Other Agencies

The Bureau of Agricultural Economics, or its predecessors, initiated and developed several lines of economic and statistical work now carried forward by other agencies. One is the work now done by the Cooperative Research and Service Division of the Farm Credit Administration. A second group of activities is the market news, research, service and regulatory activities now administered by the Production and Marketing Administration under provisions of 13 different acts of Congress (the Tobacco Inspection Act, the Perishable Agricultural Commodities Act, the Standard Container Acts of 1916 and 1928, the Produce Agency Act, the Peanut Stocks and Standards Act, the Tobacco Stocks and Standards Act, the Cotton Grade and Staple Statistics Act, the Cotton Futures Act, the Cotton Standards Act, the Warehouse Act, the Wool Standards Act, the Export Apples and Pears Act).

Activities dealing with land acquisition, development, and utilization were transferred from BAE to the Soil Conservation Service. The Bureau of Agricultural Economics constantly expanded its study of foreign agricultural production and foreign markets and established offices in a number of foreign countries until 1939, when the overseas part of this work was merged into the Foreign Service of the Department of State, and the domestic part was organized into a separate staff agency of the Department of Agriculture (the Office of Foreign Agricultural Relations).

Method of Appropriation

Today, the work of the Bureau of Agricultural Economics is financed out of three appropriations. Money is appropriated directly for economic investigations and for crop and livestock estimates, and funds are allocated to the Bureau from appropriations authorized by the Research and Marketing Act of 1946.

The appropriations for crop and livestock estimates finance the preparation and publication of State and National statistical reports on crops and livestock, agricultural prices, farm employment, and wage rates. Hundreds of thousands of farmers and businessmen send information regularly to the Bureau from every locality in the United States. They get no pay except the reports which aid them in their work. Processors, manufacturers of farm machinery, railroad officials, and other businessmen as well as farmers rely on these reports to guide them in their business. This work is performed by an Agricultural Estimate Branch which includes the Crop Reporting Board, 6 statistical divisions, 43 State or area statistical offices, and 2 statistical research laboratories at State colleges.

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Appropriations for "economic investigations" finance the Bureau's Divisions of Agricultural Finance, Farm Management and Costs, Land Economics, Statistical and Historical Research, Marketing and Transportation Research, Farm Population and Rural Life, and Special Surveys. In addition to their economic research and service work, these divisions maintain such groups of statistical series as: Farm income, farm populations, numbers and types of principal machines on farms, costs and returns by types of farm, farm assets, debts, taxes, interest rates, land values, marketing costs and margins, and food consumption. The outlook and situation reports are financed out of this appropriation. The outlook work, the statistical series, and the service work financed out of funds for "economic investigations" continue to make a major contribution to the healthy development of American agriculture. In recent years the demand for this work has been so great that it has severely limited the amount of time and money left over for economic research.

Social Sciences Still Lagging

In summary the economists, sociologists, and statisticians of the Bureau of Agricultural Economics, throughout the years, have given the individuals and officials who manage the Nation's private and public enterprise facts and figures upon which to base their decisions. The resulting decisions enter into the management of a farm or a household, the management of great business firms, the drafting of laws, the action of government officials, and the decisions of the courts.

Nevertheless, the social sciences have lagged behind the physical sciences. In 1947, before initiation of studies under the Research and Marketing Act, only about 1 out of every 7 dollars spent for research in the Department of Agriculture was going into research in the social sciences (excluding the collection of statistics). By 1949, work under the Research and Marketing Act had raised this share somewhat, but it is doubtful if more than 1 dollar in 5 spent for research in this Department is going into the social sciences even now. Yet it is only through the social sciences that man may learn to use physical science properly.

Within the next few years, this country will have to face great economic problems such as the progressive mechanization of southern agriculture, the development of vast river basins, and orderly marketing of the war-stimulated output of American farms. Vigorous economic and social research is necessary, and along with it, the collection of more nearly adequate and accurate statistics. The return will be worth many times the cost.

CONSERVATION METHODS THAT WORK

Principles of land use and measures of land treatment discovered and applied in recent years have improved and maintained the productive capacity of land, increased production per acre, and helped to check soil erosion, conserve moisture, and lessen floods. In addition, these measures have reduced costs of production, encouraged sound diversification of crops, and added to the efficiency of agriculture generally.

Soil conservation science in the United States has moved ahead so rapidly in the last dozen years, both in the research and the application phases, that our Nation is now a world leader in the field. Each year agricultural scientists from many countries visit the United States to study our conservation techniques.

Scientific soil conservation as encouraged and promoted through the Soil Conservation Service emphasizes four main procedures. First an analysis of the land on a farm reveals facts about the soils, the slopes, the extent and degree of erosion, the prevailing and past land uses, and the water to be handled on the farm.

Next, the analysis serves as a basis for determining the kind and intensity of use for which each acre is best adapted. Some lands are better suited than others for row crops. Other lands develop their capabilities best when kept in grass. Still other lands best produce trees. Determinations of land capability are being made in the United States at a rate of about 30 million acres a year. Their practical value to farmers and others has brought a sharp increase in requests to SCS for this type of service.

Third, present-day soil conservation calls for treatment of land in accordance with the determined needs. To protect it from overuse and from erosion, it is usually necessary to apply a combination of several measures. One field may require a terrace system, contouring, grassed waterways, fertilization, and a program to increase the organic content of the soil. Another field nearby may principally need drainage, fertilization, and crop rotation measures. An adjoining pasture may need liming, fertilizing, weed control, and the seeding of improved varieties of grasses. More than 50 different conservation measures are now employed in varying combinations to protect and improve farm and ranch lands. Research and experience have proved that each farm requires a combination of conservation measures adapted to its special needs.

Up to the 1930's United States farmers had to rely largely on their own devices in attempting to deal with soil conservation problems. They received much valuable scientific help in many other aspects of their work, but little in the care of soil and water resources. Modern conservation endeavors to fill this gap. As part of a many-sided national program, it provides trained conservationists to assist the farmer with the land problems on his farm. This direct on-the-farm scientific aid has met a widespread need. Few farmers have the training or experience required to make a land analysis sufficiently thorough and accurate to establish the capabilities of their land for intensive uses or to indicate the combination of measures necessary to conserve and improve it. Conservation measures, particularly those designed to control water, almost always require professional skill if they are to be durable, safe, and effective. Professional help is useful also in adjusting physical operations on the land to economic requirements.

These principles and methods look toward individual farm conservation plans. This is a long-range objective. Much work must be done meantime to cope with immediate requirements. There is no conflict, however, between immediate and long-run goals. All conservation work, if it is scientific, builds for the future. Thousands of farmers now regard an adequate farm conservation plan as a necessary

part of their farm management program as a whole. Already one-tenth of the Nation's farms are covered by scientifically prepared farm conservation plans.

During the past year farmers organized 132 new soil conservation districts in the Nation. This brought the total of such districts up to 2,141 that included more than 1 billion 100 million acres and more than 4½ million farms and ranches.

The Department of Agriculture signed memoranda of understanding with 162 soil conservation districts during the year. The Soil Conservation Service actually began to furnish technical aid to 154 of these districts. Up to date, the Department has signed memoranda of understanding with 2,086 districts and the Soil Conservation Service was assisting 2,078 of these districts at the end of the year.

Soil Conservation Service technicians, working with farmers on the land, were able to develop 114,892 detailed farm conservation plans during the past year. These new plans covered more than 32 million acres. Needed conservation measures and land use adjustments were completed, according to plan, on more than 22 million acres during the year.

One main problem on which the Soil Conservation Service concentrated its efforts was to increase the quantity and quality of grass and legume seed available for conservation plantings. High-quality seed for many of the most desirable conservation plants has been scarce for several years. In view of an expected increase of grass and legume plantings during the years immediately ahead, it is expected this scarcity may become even more acute. The service has started a program to encourage and help cooperating farmers in soil conservation districts to increase their production of such seeds.

A trend toward increased use of supplemental irrigation, mainly by sprinkler systems, in the humid East was noted during the past year. Service engineers had many requests for technical help in installing such systems; they were hard pressed to meet the demands. In the fruit- and vegetable-growing sections of the East this trend toward supplemental irrigation seems likely to continue.

Farmer Cooperation in Conservation

The Department's programs of production and conservation, keyed simultaneously to the requirements of the land and of the people, are currently reflecting the need for agricultural readjustments from wartime to peacetime conditions. The reduced need for producing cash crops gives farmers a chance to modify their cropping systems and at the same time build up their soil. The Agricultural Conservation Program encourages and helps them to grasp the opportunity.

Farmers have not usually been able heretofore to fill the demand for agricultural commodities, and at the same time pay the cost of the depreciation of their production plant. They have had to draw on soil resources; that is to say, on their basic capital. Soil resources are not inexhaustible. Under a system of wise soil management, however, the farmers can make their land produce without losing its productive capacity. The agricultural conservation program helps them to establish and follow such a system.

In 1948, however, the appropriation available for this program was reduced. Funds allocated for it were about 53 percent below those of the preceding year. Actual conservation practices applied under the program dropped 42 percent. Only the momentum from previous years help to prevent a greater drop. Committees elected by farmers to help in formulating and administering the agricultural conservation program were able to suggest some useful changes in the use of ACP funds. Specifically, they advised reduction or elimination of assistance for some practices previously encouraged, and asked increased emphasis on the most urgently needed conservation practices.

The following summary shows the extent to which various agricultural conservation programs were put into operation in the year 1948 and during the period 1936–48:

Practice		*Extent*	
		1948 program	*Cumulative 1936–48*
Seeding pastures	acre	3, 538, 076	40, 801, 918
Dams and reservoirs	number	66, 541	796, 794
Green manure or cover	acre	14, 086, 622	213, 145, 093
Terracing	miles	59, 571	798, 087
Contouring intertilled crops	acre	2, 245, 819	87, 138, 256
Contouring close-sown crops	do	2, 174, 728	28, 972, 217
Contouring stripcropping	do	193, 310	4, 706, 972
Lime—conserving uses	ton	22, 284, 665	208, 326, 582
Phosphate—conserving uses	do	2, 355, 361	18, 085, 556
Tree-planting	acre	61, 065	688, 450

Program assistance in the form of materials, services, or payments has now been reduced to about 50 percent of the out-of-pocket cost of completing approved practices, with the farmer paying the other half. This, together with the fact that the cost of carrying out conservation practices has increased over the years, has resulted in a higher cost for the farmer. In a period of lower income, it is possible that the Government's share of the cost may have to be increased if we are to keep up at least the present volume of conservation.

Larger appropriations for 1949 permitted resumption of the agricultural conservation program on the scale followed previous to 1948.

In an effort to develop improved methods of planning and operating the program, an experimental "Farmer's and Rancher's Conservation Program" was initiated during 1949 in selected counties of 9 States. This program seeks to explore systematic ways in which ACP assistance can be focused more directly on the problems which are retarding progress by individual farmers in establishing and maintaining conservation systems of farming.

Under this activity, which is still in progress, the community committeeman visits each farm in his locality for the purpose of helping the farmer set down on paper, for each area of his farm, his conservation problems, the conditions associated with those problems, and the farmer's own program for dealing with these problems.

The work of the community committeemen is carried out under the guidance of the county committeemen, who assume the responsibility for the undertaking in the county. Preliminary preparation includes necessary training of community committeemen, usually furnished through the cooperation of educational workers and other technical advisors.

The conservation program outlined by the farmer covers a period as far ahead as he is able to see at the time of the committeeman's visit. However, the farmer is encouraged to make any changes which in his judgment are needed from time to time.

A significant feature of this experimental approach lies in the opportunity afforded both the farmer and his neighbor-committeeman to better relate the farmer's individual needs to the kinds of ACP assistance that can be made available. Attention is drawn not only to the most needed conservation measures but to the order and combinations in which they can be applied most effectively.

County and community committees will use these farmers' programs to develop and carry out an agricultural conservation program that will more nearly meet farmers' needs and obtain the greatest amount of conservation with the funds available.

Since the Farmer's and Rancher's Conservation Program is still on an experimental basis, it is not possible to determine with certainty how much the agricultural conservation program can be improved through this approach. What has been done to date, however, appears so promising that the activity will be expanded to counties in additional States in 1950.

FLOOD CONTROL

Conservation and forestry measures and related gully control and streambank stabilization structures, small detention dams and debris basins, and other works are being installed under the Department's flood prevention program on portions of 11 authorized watersheds. They attract wide attention for their effectiveness in reducing floodwater and sediment damage.

Such improvements, planned on a subwatershed basis with the cooperation of land owners and operators and other local persons, groups, and units of government, are under way in 428 subwatersheds averaging about 8,500 acres each and on some national forest lands. They are forerunners in the Department's contribution under the Flood Control Acts toward reducing upstream flood damage that may follow intense or prolonged rainfall. They also help to keep sediment out of stream channels and main-stream reservoirs, to protect other downstream flood control works, and somewhat to reduce the peaks of major floods.

In river basins for which over-all agricultural programs are developed, watershed improvement measures will be simultaneously a part of the effort to develop and use land in accordance with its capabilities and to maintain a stable agriculture.

The watershed area now authorized for improvement totals only some 57,000 square miles; but a report embodying watershed improvement and other aspects of a broad agricultural program has been completed for the Missouri Basin which extends over more than 509,000 square miles.

Reports are in various stages of completion on some 69 other watersheds or portions thereof; 8 of these reports are in final review within the Department. Watershed improvement programs thus recommended are considered and approved by the Congress before funds are made available.

Improvement work in the mountain portion of the Los Angeles River watershed, 1 of 11 watersheds authorized for operations, was the first such project undertaken with Flood Control funds. It is immediately above the metropolitan area of Los Angeles and involves the protection of high values. Work has been mainly concentrated in the Arroyo Seco; but fire control is being developed throughout the watershed to high flood-control standards. Channels and waterways in the lower agricultural areas are being stabilized.

The problem in the Arroyo Seco, which has steep slopes and a narrow channel, was to stabilize the slopes with vegetative cover adequately protected from fire so that slides and erosion would not carry additional sediment into the channel. It was important to prevent further cutting in the channel bottoms, and to stop the downward movement toward the city of large quantities of unconsolidated material in the main and tributary channels.

To accomplish this a barrier has been constructed in the main channel of the Arroyo Seco and 55 smaller structures have been installed in the side drainages. These structures control nearly a million cubic yards of unconsolidated debris in the channels and prevent channel deepening. They also hold the toe of the side slopes and make it possible to establish vegetative plantings on exposed slopes as a means of preventing erosion.

Recent advances in fire-control techniques have been utilized. Helicopter transportation has been substituted for ground transportation in fire suppression. Faster and more effective communication by radio has been introduced. As a result, the mileage of mountain fire-control roads formerly considered essential has been reduced by about three-fourths, and the related earth disturbance and creation of erosion potential has been correspondingly reduced.

In the other authorized watersheds the downstream value to be protected is not usually so concentrated; it is mainly agricultural. For example, in the Washita, Trinity, Middle Colorado, and Little Sioux the subwatershed lands are generally rolling with considerable portions cultivated. The balance usually has grass or forest cover.

The problem is to increase the infiltration of rainfall into the soil; to retard and control the run-off and waterflow, principally from cultivated and grasslands; and to prevent surface, gully, and streambank erosion.

Chief Improvement Measures

Improvement measures include the retirement from cultivation of steeper slopes and thinner soils; the reseeding of such slopes to native or adapted range grasses; cultivation on the contour; strip cropping and terraces where needed; construction of ditches to divert run-off from eroding slopes; establishment of grassed waterways; and of gully, channel, and streambank stabilization structures. Where the volume of run-off causes damage by flooding, scouring or depositing sediment on bottomlands, and where suitable sites are available, small detention dams are sometimes installed.

Measures on the land are generally installed by the land owner or operator with technical assistance and some materials and equipment supplied by the Department or a local unit of government. Measures

that benefit principally downstream interests are installed largely at public expense except for sites. In subwatersheds for which work plans have been completed, the installation costs on privately owned lands will be borne approximately 60 percent by local interests and 40 percent by the Federal Government. On the national forest lands they will be borne wholly by the Government.

MISSOURI BASIN PROGRAM

Formulation of a comprehensive agricultural program for the Missouri River Basin began in 1948, through the cooperative effort of 9 agencies of this Department and the agricultural and forestry agencies of 10 States. The plan was completed in 1949. I recommended it to the President and to the Congress.

The plan calls for a comprehensive integrated 30-year program throughout the Missouri River Basin. Principal features are: Conservation and improvement measures on grassland, cropland, and forest land; stabilizing measures for small watercourses; aids to irrigation and drainage—all at an estimated total cost of 8.5 billion dollars, toward which the Federal Government would contribute 3.1 billions.

The proposal is a landmark in agricultural planning. It is the first integrated agricultural plan for a major river basin that takes into account all the region's agricultural resources, in a program for sound use, desirable development, and proper conservation simultaneously. Moreover, it contemplates flood control; the improvement of water supplies for domestic and industrial uses and for irrigation; navigation and hydro-power production; the protection of fish and other wildlife; and enhancement of recreational facilities. It will complement vast main stream engineering developments in progress under the Pick-Sloan program authorized by Congress in 1944.

Needless to say, the Department of Agriculture has a vital interest in the full development of the resources of the Missouri Basin. With the Nation's growth in population, in food consumption per capita, and in responsibility for nutrition in various foreign countries, it faces increasing needs. The fact that occasionally we have surpluses does not contradict this statement. Adjustment of production to the long pull is different from the annual or current adjustment, and warrants different responses. The development of agricultural lands through irrigation, drainage, and clearing is one of the few sources left for meeting expansion in long-time needs. Proper development of such lands may promote a wiser use of all our lands and water resources, and in that way may help to build a sound and enduring agriculture, with benefit to farm families and with strengthening of local and regional economics.

It is old doctrine in the Department of Agriculture that the broad national interest as well as the regional interest should have attention in the formulation and development of resource policies and programs. This principle, which Congress affirmed in flood control legislation, receives full recognition in the plan proposed for the Missouri River Basin. According to the flood control laws, participation of the Federal Government in flood control projects is justified if benefits to whomsoever they may accrue will exceed the costs. Thus

the rule covers on-site and off-site benefits; benefits to individuals and to the public generally; for example, the protection afforded to lands on which flood control work may be actually done, and the protection afforded to downstream lands and interests. The Missouri Basin plan reaffirms this principle.

Irrigation Developments Favored

The Department advocates general application of this principle. It approves the development and improvement by irrigation of suitable lands to the extent that water is available. When such development would be otherwise impossible, it favors contributions by the Federal Government. The Department believes the Federal contribution should equal the difference between the costs of irrigation projects and the amounts that local beneficiaries could reasonably be expected to contribute. But the Federal contribution should not cause the total cost of the projects to exceed the total estimated benefits. All local beneficiaries should share the cost-reimbursement charge—commercial, transportation, and other business interests as well as direct water-users. The reckoning of reimbursement obligations should consider the importance of maintaining a standard of living for benefited farm families equal to that of families on comparable farm units.

State and local organizations should assume as much responsibility as possible for initiating, installing, operating, and maintaining irrigation projects. Authorization by Congress should be required, however, for any project to be constructed in whole or in part by any Federal agency, or for any project that would necessitate a substantial Federal contribution. Wherever feasible, such developments should be a part of multipurpose undertakings. The Department favors full recognition of all private existing water rights and also the existing rights of States with respect to land and water resources. It urges and welcomes full participation by the States in Federal planning activities.

Participation in Multipurpose Programs

Other developments of importance in connection with the use, development, and conservation of resources took place during the year. Under the leadership of the Bureau of the Budget this Department cooperated in the development of a more satisfactory basis for participation by the Federal agricultural agency in the Federal reclamation program generally. A satisfactory solution to this problem is now in sight. The Department has long desired better machinery for coordinating the planning and work of multipurpose programs for land, water, and forest development in major river basins. Useful discussion of this matter took place among interested agencies during the year and resulted on the part of this executive agency in some definite recommendations.

With regard to the Columbia Valley area, for example, the Department urged that in any reorganization of Federal functions such as that contemplated in the proposal to establish a Columbia Valley Administration the integrity of Nation-wide programs should be

strengthened and protected. A vast program of main stream engineering is under way in the Columbia Valley without corollary acceleration of watershed improvements. Proposals to correct this shortcoming, so that downstream and upstream work will match, involve functions of this Department—notably its programs for forestry and soil conservation. Such functions in multipurpose program areas, in the Department's opinion, should continue to be administered by the regular Federal agencies, as part of their nation-wide operations. To reconcile national and regional interests in many-sided programs, it might be well to establish coordination machinery in the Office of the President.

ELECTRICITY FOR AGRICULTURE

Rural electrification constitutes a modern revolution in the application of power to agriculture.

To date about 400 farm uses for electricity have been reported. Even so, the application of electric power to farming operations is still far from achieving its full possibilities. Many farms still are to be equipped with electric production tools; others await the installation of such ordinary home conveniences as pressure water systems and modern bathroom facilities.

To aid in the development of equipment for farmers, the Rural Electrification Administration has focused attention on the special needs of rural people in an effort to encourage research and the manufacture and distribution of special equipment that meets farm needs. Many of the applications being made are completely new developments; others are merely new uses for existing equipment.

Some of these new developments contribute to better income for the farmer. Others are time- and labor-saving. Farm people are anxious to learn about these new uses for electric power. The increasing number of electrically operated devices on rural lines is evidence that farmers are putting the equipment to work.

Electric milking machines and milk coolers are making it possible for more and more farmers to receive premium prices for the milk they sell. The electric pasteurizer for farm home use is expected to help reduce the number of cases of undulant fever among rural children.

Electric brooders are helping farmers save increasing numbers of their pig and lamb crops. Poultrymen, too, are using electric brooders, as well as water warmers, automatic feeders, and "debeakers."

One of the major factors in the rapid expansion of rural electrification is the area-coverage program of the Rural Electrification Administration. A few rural electric cooperatives have already extended their lines so that they can offer electric power to all farms in their service areas. Others are approaching that goal.

Progress Since REA Began

In 1935, when REA was established, less than 11 farms in 100 had central-station service. That number had jumped to 75 farms in 100 by June 1949. Rural schools, churches, and country stores with electric service number into the tens of thousands.

More than 170,000 miles of new lines were energized during the 1949 fiscal year by REA borrowers. This was an increase of 42 percent over construction in the previous peak year of 1948. It brought the total of power lines being operated by REA borrowers to 839,000 miles.

About half a million farms and other rural consumers were added during the year, bringing the total of those served by REA borrowers to 2,778,000 rural consumers.

By the end of the fiscal year 1949, REA had advanced a cumulative total of $1,272,428,525 to borrowers to finance construction. This included $321,286,867 advanced during the year—a new high.

Total loan approvals by the end of the year had reached $1,830,318,853. During fiscal 1949, REA approved loans totaling $448,859,597, or $128,000,000 more than in any previous year and nearly as much as was approved during the entire first 8 years of the program.

REA's backlog of pending loan application at the close of the year totaled $420,000,000.

REA borrowers take a businesslike approach to the problem of extending electric lines to all rural consumers in their service areas. They determine optimum boundaries and make surveys to determine the probable power demand. Their engineers plan electric systems to meet the developing needs of all consumers to be served.

New methods of preventing crop loss have been developed. Many farmers are using electric power to ventilate barns and crop-storage buildings; they save grain and hay by reducing the moisture content after storage. Grain and baled hay elevators, ensilage unloaders, chopped hay and ensilage blowers, and semiautomatic feed grinders are among the newer electric-powered equipment used increasingly to save time and labor and to improve the quality of farm production.

Electric pumps are becoming essential to both surface and sprinkler methods of irrigation.

Another trend in the application of electricity to farm needs is the increasing use of electric equipment in farm processing. In the Middle West, electric power for drying, shelling, cleaning, and grading hybrid seed corn and other seed is in general use.

For home processing of foods, large numbers of farm families are using food freezers. One of the newest aids in food preservation is the electric pressure canner, with built-in heating element and heat control.

Many possibilities are still to be explored in the application of electricity to farm use. Some of these are the use of light to provide artificial sunshine, to control germs and bacteria, and to trap or repel damaging insects. Other possibilities lie in the further development of supersonic seed treatment, in soil sterilization, and in the application of diathermy and electronics.

As more and more farmers adopt these new uses for electricity, the need for sound advice in this field becomes greater. Recognizing its responsibilities along this line, REA offers guidance to their consumers.

Approximately 35 percent more power was distributed by REA-financed systems during fiscal 1949 than in fiscal 1948. Borrowers billed 5,474 million kilowatt-hours in 1949, as compared with 4 billion billed in 1948, and 2,800 million in 1947. This increase is attributed

to the greatly expanded use of electricity as well as to the addition of new consumers to rural lines.

Uses of Money Lent

About 82 cents out of every dollar lent by REA during 1949 was used to build and improve distribution systems to take electric power to rural consumers. About 18 cents was used in developing sources of power and in building transmission lines to connect power suppliers to the distribution systems. One-tenth of 1 cent of every dollar was re-lent by borrowers to their consumers to finance equipment purchase and installation.

Percentagewise, a greater proportion of loan funds than ever before went toward "heavying up," and for generation and transmission facilities.

The growing demands of farmers for power focus attention on two major problems facing REA and its borrowers. Not only are they obligated to extend electric service to unserved farm families, but also to see to it that rural people have adequate and dependable power.

REA borrowers have established an enviable record on repayments of their loans. Total payments on principal and interest since the start of the program amounted to $203,694,497 at the end of the year. This included $19,281,894 paid on principal in advance of the due dates. During 1949 borrowers repaid about $22,000,000 of principal and paid $12,000,000 in interest. Loan payments more than 30 days overdue amounted to only about one-half of 1 percent of the total amount due. This is an unusual record, especially in view of the fact that REA makes 100-percent loans to new and inexperienced enterprises that must learn as they serve.

REA activities, 1949

State	Total of loans approved from funds available in fiscal 1949	Line to be constructed from 1949 loan funds (estimated)	Consumers to be connected as result of 1949 loans (estimated)	Total of REA loans approved 1935 through 1949
	Dollars	*Miles*	*Number*	*Dollars*
United States	448, 859, 597	166, 238	504, 612	1, 830, 318, 858
Alabama	10, 285, 000	3, 558	20, 569	52, 422, 649
Arizona	4, 274, 000	615	1, 940	11, 280, 786
Arkansas	10, 635, 000	4, 608	16, 214	46, 651, 000
California	2, 460, 000	421	4, 926	5, 977, 329
Colorado	5, 653, 000	1, 735	4, 326	30, 714, 551
Delaware	485, 000	115	365	2, 722, 000
Florida	4, 066, 100	1, 566	4, 617	25, 422, 100
Georgia	17, 341, 000	9, 177	36, 659	77, 030, 330
Idaho	695, 000	127	388	8, 922, 315
Illinois	11, 090, 914	3, 630	11, 215	62, 411, 717
Indiana	4, 755, 000	1, 417	8, 056	44, 356, 726
Iowa	25, 882, 839	5, 934	13, 055	104, 701, 788
Kansas	19, 363, 000	8, 527	16, 863	64, 716, 351
Kentucky	16, 684, 944	4, 756	31, 483	63, 641, 799
Louisiana	5, 192, 000	2, 299	12, 940	30, 348, 600
Maine	231, 000	60	337	1, 504, 500
Maryland	2, 471, 000	639	3, 300	10, 034, 500
Michigan	10, 362, 000	1, 383	5, 772	35, 146, 221

REA activities, 1949—Continued

State	Total of loans approved from funds available in fiscal 1949	Line to be constructed from 1949 loan funds (estimated)	Consumers to be connected as result of 1949 loans (estimated)	Total of REA loans approved 1935 through 1949
	Dollars	*Miles*	*Number*	*Dollars*
Minnesota	27, 089, 000	9, 418	20, 127	107, 966, 806
Mississippi	15, 214, 238	5, 309	31, 130	61, 714, 191
Missouri	35, 479, 561	12, 413	27, 227	123, 477, 386
Montana	3, 856, 000	1, 944	2, 624	26, 215, 598
Nebraska	17, 093, 000	9, 044	14, 428	67, 055, 263
Nevada	30, 000	0	4	326, 000
New Hampshire	3, 212, 000	661	2, 042	5, 561, 000
New Jersey	244, 700	50	509	946, 200
New Mexico	7, 699, 000	1, 549	5, 482	18, 903, 000
New York	0	0	0	4, 897, 618
North Carolina	8, 037, 000	3, 967	16, 824	56, 266, 552
North Dakota	33, 090, 000	16, 187	18, 566	71, 760, 538
Ohio	5, 891, 000	1, 283	6, 581	42, 374, 580
Oklahoma	19, 073, 000	9, 358	21, 610	64, 782, 506
Oregon	3, 961, 720	360	2, 090	18, 142, 904
Pennsylvania	3, 037, 000	984	4, 655	22, 736, 200
South Carolina	13, 156, 500	3, 054	12, 775	40, 092, 769
South Dakota	16, 340, 000	9, 534	12, 635	45, 591, 154
Tennessee	18, 125, 715	5, 761	44, 000	64, 114, 323
Texas	38, 342, 771	18, 349	44, 820	152, 374, 845
Utah	0	0	0	2, 422, 000
Vermont	305, 000	121	331	3, 153, 000
Virginia	8, 213, 315	2, 870	11, 927	40, 019, 557
Washington	4, 020, 280	529	3, 556	23, 017, 391
West Virginia	470, 000	239	654	1, 422, 000
Wisconsin	12, 087, 000	1, 886	5, 724	71, 175, 615
Wyoming	2, 680, 000	787	1, 183	13, 072, 600
Alaska	185, 000	14	83	2, 300, 000
Virgin Islands	0	0	0	432, 000

FARMERS HOME ADMINISTRATION

Through a program of supervised credit, the Farmers Home Administration helps small farmers who cannot otherwise obtain needed financial assistance at reasonable rates and terms. In addition to credit, borrowers receive practical on-farm guidance, as required, to assist them in planning and carrying out sound farm and home operations.

Many applicants for Farmers Home Administration assistance are handicapped by poor land, poor farming methods, inexperience, lack of equipment, inadequate numbers or poor quality of livestock, or by a combination of such conditions. To help borrowers overcome their management problems and improve their chances of success at farming, the credit extended by the Farmers Home Administration is supplemented with supervisory assistance. Borrowers get practical on-farm guidance in analyzing and planning their farm and home operations to make the best use of their land, labor, capital, and skills on their particular farms. County supervisors advise with and guide the borrowers in carrying out their planned operations, including the adoption of improved farm and home practices, such as proper soil-

conservation measures, use of proper seed varieties, proper fertilization practices, control of insects and diseases, and the production and conservation of the family food supply. Such supervision contributes directly to the success of the borrowers and is a protection of the financial interests of the Government.

To make sure that borrowers everywhere were provided with the most up-to-date information and practical guidance, the agency took additional steps to bring them the results of new experiments and research conducted by the Department and the State agricultural colleges, and to coordinate its services with those offered all farmers through the Extension Service, the Production and Marketing Administration, the Soil Conservation Service, and other agencies.

In several States the supervisors attended short courses at the State colleges or experiment stations, which were arranged especially to give them additional training in farming techniques that are proving useful to family-type operators. This information was carried back to the borrowers. Supervisors sought not only to expand their knowledge of modern agricultural science and its application to the low-income farm, but also to develop their skill in teaching families how to adopt better practices.

Group supervision techniques were used effectively by the supervisors, in addition to their regular visits to borrowers' homes. Borrowers and their wives were encouraged to meet in small groups for demonstrations conducted by county supervisors, home supervisors, representatives of the Soil Conservation Service, county agents, and home demonstration agents. Farm ownership borrowers' business and educational meetings were held in most counties in the late winter and early spring for the analysis of each family's 1948 farming business and the making of new plans for the 1949 crop season. In many counties groups of borrowers made tours to other farms, or to experiment stations and to the colleges to see results of new methods of handling crops, developing pastures, and raising livestock and poultry.

The demand for assistance through the Farmers Home Administration continues to increase. For the past several years that agency has been unable to meet the needs of large numbers of eligible farm families because of inadequate loan funds.

During the calendar year 1948 there was a decrease in net farm income for the first time in 10 years. The index of prices received by farmers continued to decline through June 30, 1949, and at a much more rapid rate than prices paid by farmers.

The impact of this situation is particularly serious among farmers in the lower income groups who have very limited reserves, if any, to help them meet changing economic conditions.

There are also many family-sized farms in the Nation on which gross production is too limited to provide a reasonably satisfactory living for the families operating them. Also, increasing numbers of veterans and other young farmers are finding it impossible to obtain the type of credit necessary to enable them to engage successfully in farming. The only source of credit adapted to the needs of this large group of farmers who are unable to obtain credit from private sources is that available through the Farmers Home Administration.

FHA Credit Programs

During the year, four types of credit assistance were available to applicants. These were:

Direct and insured farm ownership loans are made for the purchase, enlargement, or improvement of family-type farms. Funds for insured loans are supplied by private lenders and the mortgages are insured for the full amount of such loans by the Farmers Home Administration. Direct loans are made with funds authorized by the Congress, and bear 4-percent interest. Insured loans bear 3-percent interest and, in addition, borrowers are required to pay a 1-percent mortgage insurance charge which makes the cost to the borrower the same as that for a direct loan. Both direct and insured loans are repayable over a 40-year period.

During the 1949 fiscal year, direct Farm Ownership loans were made to 1,906 new borrowers, of which 1,489 were veterans. The number of insured loans increased from 352 in 1948 to 1,181 last year. Veterans received 326 of the insured loans made in 1949. Seventy percent of the insured loans last year were made by rural banks. Increasing numbers of banks and insurance companies are investing in these insured mortgages and many owners who are selling farms prefer this type investment to all-cash settlement.

Farmers obtaining insured loans are given the same supervisory assistance through the Farmers Home Administration as those who borrow directly from the Government. From the borrowers' standpoint, the main difference between an insured loan and a direct loan is the requirement that an insured loan borrower must establish at least a 10-percent equity in the farm to be purchased. Many applicants are not in a position to meet this requirement.

Operating loans are made for the purchase of livestock, farm equipment, feed, seed, fertilizer, and to meet other necessary farm and home operating expenses. These loans bear 5 percent interest and are repayable in a period of 1 to 5 years. Operating loans are of two types: (*a*) Adjustment loans made to those farmers who need credit to enable them to adjust, expand, or to make other improvements necessary to place their operations on a sound and efficient basis; and (*b*) annual loans made to applicants whose primary credit needs are of a seasonal or emergency nature, to provide necessary credit for the production of cash crops or for the purchase or growing of feed for livestock. Animal operating loans are usually repayable in 1 year or when the income from crops and livestock normally is received. Adjustment loans are based on individual farm and home plans developed by borrower families with the advice and assistance of the county supervisor. These plans indicate the adjustments and improvements each individual borrower intends to make in his farm and home operations and how and when they will be made. Adjustment loans may be repaid over a period not to exceed 5 years, depending on the borrower's ability to repay.

Of the 125,354 operating loans made during the 1949 fiscal year, 45,558 were adjustment loans to new borrowers, 31,954 were annual loans, and 47,842 loans were made to present borrowers who needed additional financing to continue with their planned operations. There

was a considerable increase in the proportion of adjustment loans last year.

As in the case of Farm Ownership loans, applications from eligible veterans for operating loans are given preference over applications from nonveterans. Veterans received 51 percent of the funds advanced for operating loans in 1949.

Water-Facilities loans are made in the 17 Western States for the installation, repair, or improvement of farmstead facilities or irrigation systems. These loans are authorized under the Water Facilities Act of August 28, 1937, as amended, and may be made to individuals and to nonprofit water associations. Water Facilities loans to individuals usually do not exceed $5,000; and not more than $100,000 may be expended in connection with one project. Such loans bear 3 percent interest and are repayable over a period not to exceed 20 years. Water Facilities loans were made to 838 individuals and 19 associations during the 1949 fiscal year.

Flood and disaster loans. New activities of the agency were the making of flood loans to farmers who suffered losses from the floods of 1948, and the disaster loan program. Flood loans from a special appropriation were made to 835 families in Georgia, Florida, Kansas, Oklahoma, Minnesota, Montana, Idaho, Washington, and Oregon, in the amount of $1,863,005. Disaster loans were made following passage of Public Law 38 on April 18, 1949, which dissolved the Regional Agricultural Credit Corporation of Washington, D. C., and made its revolving fund available for this purpose. By June 30, all or parts of 9 States in which storms, floods, drought, or other disasters had reduced agricultural production had been designated for loans—216 counties in Wisconsin, Texas, Nebraska, Wyoming, Colorado, Idaho, Utah, Nevada, and California. Loans had been made to 266 farmers, totaling $781,522.

Repayments held to the good records of the past. On production and subsistence (operating) loans, payments were 92 percent of the maturities as of June 30, 1949, and on water facilities loans total repayments were in excess of the maturities. Active farm ownership borrowers, as a group, had paid 44 percent more on their long-term loans than their amortization schedules required. Nearly 13,000 of the 63,000 real estate loans made since 1938 have been paid in full from income, many years before final payments were due, and the paid-up borrowers are in full possession of their farms.

The financial success of these borrowers is largely attributable to the supervisory assistance provided them by the Farmers Home Administration. As a result of this practical guidance offered by the county supervisors, the majority of Farmers Home Administration borrowers are adopting improved farm and home practices. The farm and home plans for the 1949 fiscal year show that 173,000 families planned crop and livestock improvements in accordance with recommendations of Farmers Home Administration supervisors and other agricultural agencies. Approximately 35,000 families planned for new sources of farm income last year, 68,000 planned improved livestock practices such as breeding to purebred sires or purchasing improved female stock, and 42,000 planned for improved pasture and hay crops. Over 110,000 borrowers planned home and family im-

provements such as producing and storing more food, improving sanitation around their homes, and participating in prepaid health services. These examples of progress among Farmers Home Administration borrowers show that low-income farmers generally can and will improve their circumstances when provided the opportunity through reasonable credit and sound supervisory assistance.

Insurance of Real Estate Loans

The sum of $1,000,000 was provided in the Department of Agriculture Appropriation Act, 1948, to establish a farm tenant mortgage insurance fund, as authorized by the Bankhead-Jones Farm Tenant Act, as amended.

This act provides that "moneys in the fund not needed for current operations shall be deposited with the Treasurer of the United States to the credit of the fund or invested in direct obligations of the United States or obligations guaranteed as to principal and interest by the United States." Accordingly, the $1,000,000 appropriated for this purpose has been invested in the Treasury. By June 30, 1949, interest on this investment received and deposited to the fund totaled $25,714, mortgage insurance collections were $25,207, and mortgage insurance charges receivable were $20,207, making total assets of $1,071,128. During the 1949 fiscal year, loans insured and commitments to insure totaled $8,116,154. Payments to lenders on behalf of delinquent borrowers amounted to $1,041. As of June 30, 1949, total contingent liabilities against the fund were $6,873,595, exclusive of commitments to insure pending advances by lenders to borrowers amounting to $3,535,857.

ORGANIZATION OF DEPARTMENT RESEARCH

With the cooperation of research agencies of the Department the Agricultural Research Administration is developing a new system for inventorying agricultural research, marketing, and statistical projects. The purpose is to provide information, facilitate the coordination of research, help research workers inside and outside the Department, and lay a basis for improvements in the analysis and the planning of research. Research agencies in the Department send copies of financial projects and of work and line projects to the Central Project Office. In turn, this office sends the information on to agency officials that have to do with research coordination. Reports of completed actions become part of the Central Project Office's records.

Files of the Central Project Office are kept near those of the Office of Experiment Stations; this makes it possible to inventory both Federal and State research, as an aid in coordination of the Department's research projects with those of the Agricultural Experiment Stations in the States. In addition, the inventory project gives attention to agricultural research done by other than State or Federal agencies. Certain private agencies engage in agricultural research; certain industrial companies do research connected with utilization of agricultural products. Working relationships are being developed with foreign research agencies.

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Research-program analysis is another phase of the work of the Central Project Office. It is essentially of two types: (1) Appraisal of the Department's research program as a whole; (2) analysis of related program fields. Under the first type, reconnaissance studies of the Department's research program as a whole will be made periodically to assess the relative importance of different endeavors and to aid in achieving a better balance among research porgrams. This is done by grouping related projects and making analyses of the funds supporting the different fields of work.

In the second type, the work of all agencies participating in broad fields of the Department's research program will be classified and appraised. Representatives from the agencies concerned will study these data, exchange ideas, and try to improve working relationships between research groups. Duplications of effort should become apparent, as well as gaps in current research work.

This is a new approach to the problem of attaining a more efficient, better balanced, and more effective program of agricultural research.

PLANT AND SOIL INVESTIGATIONS

Plant and soil scientists and agricultural engineers of the Department report further gains reflecting the interactions that occur when several practices for optimum production are combined.

Increased corn yields in 7 southeastern States continue to offer an impressive example of the advantages of integrated research. More than 50,000 farmers in this area have participated in demonstrations of the new method of growing corn that efficiently uses adapted hybrids, large plant populations, and substantially larger amounts of plant nutrients than the common practice. An average yield of all demonstrations is over 65 bushels to the acre. More than 2,500 farmers have produced yields beyond the 100-bushel mark. The 1948 average corn yield of all the southern area was 50 percent greater than before the new practice combinations were worked out, even though only a small percentage of the farmers have started using them.

In the Midwest oat yields considerably in excess of 100 bushels to the acre have been made possible by the introduction of the stiff-stawed Clinton and Benton varieties. These permit the use of heavy fertilization to step up yields without considerable lodging, always present with the weaker-strawed varieties.

The combined approach is being applied to other crops and in other areas. Exceptional crop yields are becoming commonplace in Bureau irrigation research in the West where it is possible to control water in addition to other factors. Among these are corn yields as high as 162 bushels, grain sorghum yields as high as 174 bushels, oat yields of 114 bushels, potato yields up to almost 600 bushels, sugar beet yields of 40 tons, and alfalfa yields as high as 10 tons to the acre.

That use of large plant populations and heavy fertilization will cause moisture to be a limiting factor in the Southeast is indicated in findings this past year in Mississippi. In these investigations corn was grown at the rate of 12,000 plants to the acre on fine sandy loam. The addition of 60 pounds of nitrogen to the acre more than doubled the yields, increasing them from 36 bushels on plots

where no nitrogen was applied to 77 bushels where the fertilizer was used. But the soil moisture at 1-foot depth on the high-yield plot reached the wilting point by June 30, 5 weeks ahead of that untreated with nitrogen. At 3 feet the soil to which nitrogen had been applied reached wilting point July 30. At this depth the untreated soil did not reach wilting point all season.

Most crops have critical stages of growth in regard to water supply, and recent findings suggest methods for using the water efficiently during the part of the season when the crop need for it is most critical. Studies in the Columbia River Basin show that corn, amply supplied at the time of tasseling and silking, will withstand moderate periods of drought at other times without reduction of yield. Potatoes kept moist from the time of tuber initiation will yield as much as those kept wet all through the season. The sugar content of beets can be increased by allowing the beets to become dry a few weeks before harvesting. Irrigation following a dry period reduces the sugar content rather markedly.

Grass and Legumes

Studies indicate that for best land use in the United States, grass and legume plantings should be expanded 25 percent, and for high yields and quality these plantings should be in recently developed improved varieties. Some of these are as much superior to the grasses and legumes commonly grown as hybrid corn is to the open-pollinated varieties and will boost yields in pasture and forage to a similar extent. The major problem is to develop seed stocks adequate to meet the need for expansion. A tremendous amount of seed will be required—from 75 to 100 million pounds of improved alfalfas, a comparable amount of redclovers, and about 150 million pounds of improved grasses.

During the past year a program to increase and stock pile foundation seed of improved varieties was inaugurated with plantings in the Northwestern States of 12 acres of Tift Sudan grass, 20 acres of Atlantic alfalfa, and 200 acres of Kenland redclover.

A good example of what the project will make possible is the increase of Tift Sudan grass. Starting in 1949 with a little more than 100 pounds of seed, in 3 years it will be possible to build up this amount to approximately 10 million pounds. Tift Sudan, developed by plant scientists of the Bureau and the Coastal Plain Experiment Station, Tifton, Ga., is more resistant to diseases that cause the plants to fire badly than any other strains of Sudan grass. It is adapted to the Southeast, where forage diseases are severe.

Atlantic alfalfa, developed at the New Jersey Experiment Station, is well adapted to the humid East. It has the vigor and persistence necessary to give high yields under adverse conditions. Though it does not carry the wilt resistance of the Buffalo or Ranger alfalfas, it seems to carry a tolerance to the diseases. Seed stocks of Buffalo and Ranger will also be increased under the plan.

Kenland redclover, developed cooperatively by the Department and the Kentucky Agricultural Experiment Station, is superior in the southern part of the redclover belt, where southern anthracnose disease is frequently a serious problem. Kenland is also longer lived than other redclover strains. It has maintained good stands into the third year.

The only satisfactory answer to certain crop-production problems, such as plant disease, injury by insects, extremes in temperature and moisture supply, lies in the development of new varieties tailored by the plant breeders with the specific problems in mind.

Outstanding among 20 new varieties recently released jointly by the Bureau and State experiment stations are: Chancellor, a new, high-yielding wheat, with resistance to races of leaf rust prevalent in the Southeast; Shelby, an early to mid-season, high-quality oat variety, which in Iowa gives highest yields of all named selections originating from Bond crosses; Moore, a mid-season, stiff-strawed barley, with satisfactory malting quality for distribution in the barley region of the North Central States; Kuling, Meling, and Nanking Chinese chestnut varieties that under test since 1941 have been consistent annual heavy bearers of large-size, good-quality nuts; Progress, a new head lettuce adapted to the East, where it forms firm, sound heads under temperatures too high for western types of head lettuce.

Research With Radioactive Materials

Fundamental studies provide the accurate information from which practical techniques may be devised. Research of this type reported by Bureau soil scientists include investigations with radioactive phosphorus to trace fertilizer uptake. A study of 13 different crops shows a wide variation in the utilization of phosphorus by crops. Potatoes depend heavily on the fertilizer throughout the growing season. Corn absorbs a high proportion early in the growing period. The type of root system in the plant appears to make the difference. The actual amount of phosphorus used by the plants is relatively low. Cotton, corn, tobacco, or soybeans use less than 10 percent of an application of 100 pounds of P_2O_5. Potatoes use a somewhat higher percentage.

Placement studies with radioactive phosphorus are showing methods of increasing the efficiency of applied phosphorous. Sugarbeets fertilized with a band 4 inches to the side and 4 inches below seed level did not use the phosphorus until the plants were 5 inches high, but those treated with fertilizer mixed in the seed row 4 inches wide and 4 inches deep used the fertilizer from the beginning of growth.

Superphosphate and calcium metaphosphate were found to be the most efficient of those tested with the radioactive materials. Sometimes alpha tricalcium and dicalcium phosphate match them, but in other tests they lag far behind.

Soil Studies in the Great Plains

Basic studies are also throwing new light on other soils problems. A particularly important one because it concerns a major food- and feed-producing area is the serious decline in organic matter of soils in the Great Plains. Fundamental studies have been initiated to explore the extent and the nature of this decline and to develop management practices for restoring the organic matter and maintaining it. Preliminary field trials show crop response to applications of both nitrogen and phosphorus at several locations, indicating that losses in organic matter range from 30 to 50 percent. The findings also indicate

that the decline has now reached a point where fertility as well as moisture is limiting crop production in years of normal rainfall. The evidence points to a decline in quantity rather than quality of the organic matter and shows that nitrate production is definitely correlated with total organic matter in the soil. The crux of the problem appears to lie in methods of tillage and aeration of the soil rather than to any direct effect of the cropping systems although the losses are not so great on land cropped continuously to small grains as on land under row crops and fallow.

Advances in plant breeding continue to develop through fundamental research. For example, the 50-year quest for sugar beets with single-germ seed was ended successfully this year with the discovery of single-germ plants in a Michigan variety, H–14. Now geneticists have plant-building material which will make it possible to depart strikingly from the conventional present-day sugar beet. A commercial beet type with single-germ seed balls instead of the customary clusters of fruit would not require thinning, the one step that has held up complete mechanization of sugar-beet production.

Establishment of male-sterile lines in tobacco opens the way for introduction of hybrid vigor into this crop. Another possibility is the development of a commercial hybrid generation that sets no seed and would therefore require no topping.

Limitations of New Techniques

Research must determine the limitations as well as the potentialities of new techniques. For example, Bureau findings indicate that four of the powerful new insecticides—DDT, BHC, chlordane, and toaphene—will depress growth of some seedling plants when applied to certain soils in even small amounts. Higher soil concentration of these insecticides depresses plant growth even more. The compounds retard root development in some plants and injure the roots in others. BHC is the only one of the four materials found to affect the flavor of some plants. DDT, when applied to the foliage or to the soil, will retard the growth of certain sensitive plants without any other obvious symptoms. The toxicity to plants varies with different soil types. Some plants are more susceptible to the chemicals than others. There are differences even within varieties of plants. At Beltsville, Triumph lima beans were severely stunted by the application of wettable DDT, but Peerless limas—a sister variety—showed no injury under the same condition. Nor were 13 other varieties of lima beans in the same experimental plot injured when tested with the same treatment.

Basic studies are in progress to find new or more efficient chemicals for use as fungicides and plant-growth regulators. This year 506 synthetic organic compounds prepared by Department entomologists for study as possible insecticides were screened for fungicidal properties. Preliminary tests have shown 10 to be promising; these will be studied further to determine their usefulness as sprays for orchard disease control. Other compounds have shown good fungicidal properties but cause some injury to foliage. These materials will be tested for usefulness in combating soil- or seed-borne fungus parasites, organisms that destroy stored food, or those that cause deterioration to

fabrics or lumber. Some of the compounds may prove effective as bactericides or plant growth regulators. Approximately 600 organic compounds have been tested for plant-growth-regulating qualities and 116 of these have caused plant responses.

Studies of Agricultural Uses of Electricity

Since more extensive use of electricity is being made on the farm, some agricultural uses of ultrasonics appear to warrant immediate investigation; they include biological effects on plant and animal materials, bacterial control, sterilization or pasteurization of milk and other food products, homogenization of milk, emulsification and near dispersion in liquids, coagulation of particles suspended in fluids, and control of insects and diseases.

Study of the biological effect of ultrasonic energy on insects indicated that mosquito larvae were killed within 5 seconds in water with 400 kilocycle waves of an estimated 300-watt energy. Limited tests at lower intensities showed that the percentage of mortality was directly correlated with the amplitude of the waves. Under similar conditions larvae of the codling moth required up to 1 minute for killing. Those imbedded in fruit were apparently undisturbed by the treatment. Ultrasonics did not appear to be suitable for sterilizing fruit juices, because the treatment destroys vitamin C. In other tests particles of DDT and similar materials were reduced by ultrasonic vibration to smaller size than possible by the usual processes of reduction.

Hybrid Corn for Italy

Technical assistance in a program to provide Italy's farmers with hybrid corn was given in 1947 at a school established in Italy for instruction in corn-breeding methods. Italian specialists were provided with seed of many hybrid varieties for testing and demonstration. Results of the first season showed that some hybrids that have been successful in the northern part of the United States Corn Belt are well adapted to the Po Valley. In a number of cases the yields have been as much as 50 percent greater than those common to the region.

Many Foreign Countries Aided in Plant Research

Surveys led to recommendations for the improvement of crops in other countries. Often these called for long-term plans, results from which will not come as quickly as did those reported from the introduction of hybrid corn in Italy. The Egyptian onion industry is such a case. At the request of the Egyptian Ministry of Agriculture, technicians from the United States made an extensive survey of onion production in Egypt. They recommended breeding improved varieties of onion and the adoption of changes in harvesting methods. Egyptian onion breeders were supplied with foundation stocks of hybrid onion varieties now being developed in this country.

Still another type of technical assistance to other countries aims to protect crops in this country as well as in other parts of the world. Plant scientists of the Department have teamed with research workers in Brazil to study the cause and control of tristeza, a serious virus disease of citrus fruit on sour-orange rootstocks.

First observed in Argentina about 1930 and then in Brazil in 1937, the disease now occurs in most of the commercial citrus districts of Argentina, Brazil, and Uruguay. Similar disorders have been reported from South Africa, Java, Australia, and southern California.

Results of the cooperative work in Brazil demonstrate conclusively that the disease is caused by a virus, which can be transmitted by an insect vector—the black citrus aphid—and by budding.

Rootstocks of sweet orange, mandarin, and tangerine varieties have proved tristeza-tolerant for scions of various sweet orange and grapefruit varieties.

The research in Brazil is of the utmost importance to growers in the United States. The disease known as "quick decline" in southern California is very closely related to tristeza. Although the spread is not so rapid, growers are concerned that it will wipe out all trees planted on sour orange rootstock. This would mean about a third of the plantings in Florida, about half of those in California, and nearly all in Texas. Roguing the trees as soon as they become affected and replanting on resistant rootstocks are the measures now recommended to control quick decline.

Within the past 3 years considerable technical assistance has been given to research workers in Africa and South America. In the Belgian Congo the chief problems under consideration are development of soil surveys and of chemical and plot experimental methods. Guidance has also been given in compiling material from authoritative references and setting up training programs for young scientists. In Latin America emphasis has been on studies to determine potentials for production and recommendations on crops to be grown and methods for growing them.

Bureau soil scientists have also given important services to FAO and UNESCO in developing material to help administrators and agricultural advisors in other countries make fuller use of available knowledge and materials.

RESEARCH IN INSECT CONTROL

Research in the field of insect control, conducted by the Bureau of Entomology and Plant Quarantine, continued to produce important results. The insecticidal value of new chemicals was determined, and equipment and methods for applying insect control measures were improved upon. As more information regarding the toxicity of DDT and other new insecticides became available, recommendations or suggestions as to their use by the public were made or modified. Some of the research findings have already brought about or may eventually result in changes in methods used in combating certain insect pests and plant diseases. Following are a few examples of progress along different lines.

Insecticidelike Pyrethrum Made Synthetically

Culminating 15 years of intensive studies, Bureau chemists succeeded in producing, in the laboratory, pyrethrum-like esters almost identical in structure to part of the insect-killing principle in pyrethrum. One of the compounds produced was found, in laboratory tests,

to be equally as toxic to houseflies as the natural ingredient derived from pyrethrum flowers. The synthetic materials have the same desirable quick "knock-down" action of pyrethrum and remain stable in storage for a longer period. Synthetic pyrethrum is already being produced commercially. This discovery may thus be the first step in the development of a means for providing, through chemistry, a substitute for a plant material of wide importance in the control of certain kinds of insect pests and for which we have been entirely dependent on foreign sources for supplies.

Insect-Repellent Cotton Bags

A practical method of treating cotton bags with chemicals to make them insect-repellent was developed cooperatively by the Bureaus of Entomology and Plant Quarantine and Agricultural and Industrial Chemistry. The investigations were financed in part by funds authorized under the Research and Marketing Act of 1946. The chemicals—pyrethrins or a mixture of pyrethrins with piperonyl butoxide—can be applied to warp yarns at the time these yarns receive the usual sizing treatment preparatory to weaving. Baking tests conducted at Kansas State College indicate that the quality of flour stored in treated bags is not affected. From information available to date, it seems unlikely that, at the rates and methods of application used, products packed in insect-repellent bags will be contaminated. Further work to settle this question is under way. The treatment protected flour from flour beetles, cadelles, Mediterranean flour moths, lesser grain borers, and other insects that are able to penetrate or deposit their eggs through the fabric of untreated bags. In one test, bags of treated cloth admitted no insects during a 7-month period, while an untreated bag let in 563 insects. The Textile Bag Manufacturers Association and several large bag manufacturers are interested in commercial use of this treatment, which may prove of great value in conserving flour and other cereal products, especially in warm countries.

Insects Carry Phony Peach Disease

Stem-feeding leafhoppers have now been incriminated as the carriers responsible for the spread of the serious virus disease called phony peach, which has caused the loss of more than 1,500,000 peach trees in Southeastern States from the Carolinas and Georgia to Texas since 1929. Diseased trees are dwarfed and produce limited numbers of undersized fruit. There is no known cure for this disease. For many years the Bureau of Entomology and Plant Quarantine and cooperating State agencies have inspected orchards and nurseries in the affected areas to locate trees that are diseased. Growers have been encouraged to destroy all infected trees that are found in order to reduce the losses caused by the disease and to reduce its spread.

The leafhopper species that have been found to carry the disease are general plant feeders which suck the juices of peach trees at certain times of the year. The knowledge of the insects which spread the disease has provided a new means of attack on the phony peach problem. Experiments are under way to develop insecticidal treatments that will kill these leafhoppers as a possible means of protecting commer-

cial plantings of peaches in the infected areas. Because of the long incubation period of phony peach disease in its tree host two or more years will be required to determine the results of these experiments.

New Materials Replace DDT in Dairy Barns

Entomologists, chemists, and veterinarians, cooperating in investigations on the toxicology of DDT and other insecticides, found that the application of DDT directly to milk cows for controlling insects results in the presence of small quantities of the insecticide in the milk and that even smaller quantities can sometimes be detected in milk following ordinary use of DDT in dairy barns for fly control. In the spring of 1949 the Food and Drug Administration announced that the presence of DDT in milk would be contrary to the Food, Drug, and Cosmetic Act. The Bureau of Entomology and Plant Quarantine, as a precautionary measure, therefore advised that DDT not be used on dairy cows for insect control nor for fly control in dairy barns or other places where milk might be contaminated.

Methoxychlor, one of the new chlorinated hydrocarbon insecticides, was found to be effective for controlling major insect pests on dairy cattle and for use as a residual spray for controlling flies in and around farm buildings. After the Food and Drug Administration had indicated that the use of this material would be unobjectionable from the health standpoint, the entomologists recommended that methoxychlor be substituted in place of DDT for controlling insect pests on dairy cattle and as a residual spray for fly control in dairy barns and other buildings where milk is processed.

Experiments with the essentially pure gamma isomer of benzene hexachloride—known by the common name "lindane"—conducted in cooperation with various State workers and the insecticide industry, showed that this insecticide applied as a residual spray is effective for controlling flies. Lindane was recommended as an additional residual insecticide for fly control in dairy barns and milk rooms after tests conducted in collaboration with the Food and Drug Administration and other agencies indicated that milk would not be contaminated from such use. Lindane has not been recommended, however, for use on dairy cattle for insect control. The entomologists have cautioned that neither methoxychlor nor lindane should be applied to forage that is to be fed to dairy cattle or to animals being finished for slaughter.

Community-Wide Early Treatment Controls Cotton Pests

An experiment conducted in Wharton County, Tex., in 1948 suggested the value of early-season use of insecticides when applied on a community basis for the control of cotton insects. All cotton farmers in four communities of this county cooperated by applying insecticidal dusts to their entire cotton acreage early in the season. The boll weevil was the predominant pest in three of the communities and a dust mixture containing 20 percent of toxaphene was used. The cotton fleahopper was the most important problem in the other community and the dust mixture applied there contained 10 percent of toxaphene. Nearby undusted communities served as checks.

The treated cotton in the three communities heavily infested by the boll weevil averaged 74 percent fewer punctured squares, 79 percent more blooms, and yielded 44 percent more lint cotton than did the untreated cotton in the check areas. In the one treated community where the cotton fleahopper was the primary problem, an average of 340 pounds of lint cotton was produced per acre as compared with 230 pounds in the untreated check areas, representing a gain of 48 percent resulting from the treatment. In most of the fields in these four communities, two applications of insecticides gave control for the season.

The results, while indicative, cannot be considered entirely conclusive on the basis of this one experiment. They do, however, suggest the desirability of conducting more community-wide tests of a similar nature to determine the areas and conditions where early season applications of insecticides for cotton insect control might prove profitable.

New Materials Help Control Grasshoppers

Surveys in the fall of 1948 indicated that serious outbreaks of grasshoppers were likely to occur in many parts of the West and Midwest during 1949. Infestations of especial severity were anticipated in eastern Montana, Wyoming, and Colorado, in western Nebraska and Kansas, and in Texas.

In general, weather conditions in the spring and early summer of 1949 were highly favorable to grasshopper development over much of the infested territory, with the result that the areas infested and the intensity of infestations exceeded expectations. Infestations were especially critical on a few million acres within the major outbreak area on range land in Montana and Wyoming.

Intensive research over the previous 3 years had shown two new insecticides, chlordane and toxaphene, to be more effective than materials then in use for the control of grasshoppers. This resulted in a change in grasshopper-control practices in 1949. The effectiveness of these new materials as sprays and dusts has provided farmers with a means of protecting their own crops when only local infestations are involved. They were encouraged to utilize these materials to combat grasshoppers by individual or community effort and made wide use of this means to protect their own crops.

In the more heavily infested range area of the West, the Department cooperated with the States in a jointly organized and financed control program which resulted in treatment of some 3 million acres, using a new bait formula consisting of coarse bran impregnated with oil solutions of either chlordane or toxaphene. The purpose of this program was: (1) To suppress this outbreak of grasshoppers before there was opportunity for migration to uninfested areas, including high value croplands in these and surrounding States; (2) to protect, insofar as possible, summer and winter range so essential to the livestock industry of the area; (3) to prevent continued overgrazing (cattle, sheep, plus grasshoppers) which eventually destroys the most productive native grasses and invites erosion, leads to the establishment of weeds and other inferior vegetation, and thus requires costly rehabilitation practices. Baits containing chlordane or toxaphene kill more quickly and remain effective for a longer period than

those containing sodium fluosilicate; consequently they result in more effective grasshopper control at greatly reduced cost.

These new developments stimulated much local interest in the possibility of effective grasshopper control in the sparsely populated, semiarid grasslands where many of the more destructive outbreaks of these pests have originated. There was excellent cooperation on the part of States, counties, and individuals. Although available facilities did not permit treating the entire infested area, excellent results were obtained by baits spread with either aerial or ground equipment.

Advancement Made in Methods for Disinfecting Aircraft

Progress in the important problem of preventing the accidental introduction into this country by airplane of new insect pests dangerous to agriculture and public health has been made through development of practical methods for applying residual and space treatments in planes. Freon—carbon dioxide propelled insecticide solutions that adhere well to treated surfaces without injurious effect or leaving an unsightly deposit—have been developed and are being used in commercial and military aircraft to prevent spread of the Japanese beetle. The residues remain toxic to the insects that later come in contact with them.

An automatic device for dispersing space aerosols in planes has also been modified and perfected by the Bureau of Entomology and Plant Quarantine in cooperation with several other Government agencies. Dispensers of this type installed on two planes of the Military Air Transport Service operating out of Honolulu have given satisfactory services for 6 months. The apparatus consists of a centrally located aerosol supply tank, connected by copper tubing to electrically controlled valves equipped with aerosol nozzles. The valves are so located that, when operated by a single switch with automatic time control and recording devices, the aerosol mist completely fills the plane, thus contacting any insects that may be present.

New Japanese Beetle Treatment Helps Nurserymen

A new treatment has been developed which enables nurserymen to ship most balled or potted plants outside the Japanese beetle quarantined area at any time of year. Solutions of ethylene dibromide had been found highly effective for controlling the soil-inhabiting stages of the beetle, but some kinds of plants could not tolerate the concentrations necessary to kill the insects. A mixture of that material and chlordane—another insecticide effective against soil-inhabiting stages of the beetle—containing reduced amounts of each insecticide was found to give good control with less hazard of plant injury. An ethylene dibromide-chlordane dip for treating soil about the roots of plants was therefore authorized as a Japanese beetle quarantine treatment. Treatments previously approved were not effective against eggs of the beetle, thus plants could not be certified for shipment during the summer period when eggs were present in the soil. The new treatment kills eggs, larvae, and pupae and therefore makes certification possible under specified conditions at any time of the year.

CHEMISTRY WIDENS USES FOR FARM PRODUCTS

Increased use of farm commodities as industrial raw materials, better commercial methods for preserving foods, and new or improved products made from things the farmer grows are results of research reported by the Bureau of Agricultural and Industrial Chemistry. Much of the Bureau's work during the year was done in cooperation with industrial processors of agricultural materials, as well as with other Federal research agencies and State experimental stations. Accomplishments at four Regional Research Laboratories and numerous field stations helped to expand markets for farmers and provide a wider variety of better quality products for consumers.

Progress in Citrus-Fruit Processing

Frozen orange and lemon purees, made from whole fresh fruit, are important new citrus products developed by the staff of the Bureau's laboratory at Pasadena, Calif. (formerly located in Los Angeles). These purees are being produced commercially for bakeries, ice-cream manufacturers, and other food processors. They retain the full natural flavor and nutritive value of the fresh fruit and will keep in storage (at 0° F.) for more than a year with little or no loss of flavor, color, or vitamin C. Large-scale production of frozen orange and lemon purees, confined so far to California, is virtually just beginning. The process for making them will soon be introduced into other citrus-producing areas, particularly in Florida.

Besides making excellent sherbets and ices, the frozen citrus purees are good in cakes, pies, marmalades, and beverages. California growers are particularly interested in the possibility that frozen puree can be made from Navel oranges, which constitute more than a third of the State's orange crop. These oranges are not suitable for ordinary processing because their juice tends to turn bitter. The new pureeing process overcomes this difficulty, but unwanted gelling of the Navel-orange puree has proved troublesome. Work is continuing at the Pasadena laboratory to solve this problem.

More than 9 million gallons of frozen concentrated orange juice, another new citrus product, were produced in the 1948–49 crop year and found a ready market. This highly successful concentrate was developed through cooperative research by the Florida Citrus Commission and the Bureau's Winter Haven, Fla., laboratory. It is now being prepared at about a dozen plants in Florida and California. Output during the 1949–50 season is expected to reach 20 million gallons in Florida alone, equivalent to more than 20 percent of the State's orange crop. The Bureau's laboratory at Pasadena, working with citrus growers on the West Coast, has helped to adapt the vacuum process used in making the frozen concentrate to California oranges.

Advances in Food Freezing

Studies at the Western Regional Research Laboratory in Albany, Calif., have demonstrated that indirect-immersion freezing is a safe as well as speedy and economical method of food preservation. This process is several times as fast as conventional air-blast package freez-

ing and appreciably faster than the more expensive plate-freezing method. In indirect immersion freezing, food products are packed in hermetically sealed containers and then immersed in a refrigerated liquid until frozen.

The procedure has heretofore been considered dangerous for preserving unpasteurized nonacid or only slightly acid foods, because it was supposed that certain food-poisoning organisms might develop in the hermetically sealed containers. The Western Laboratory's experiments show, however, that this is not the case. Work to obtain data required for designing commercial immersion-freezing equipment is continuing at the Laboratory. This should help to open the way for wide application of the process by the frozen-food industry.

Further advances in "dehydrofreezing" have been made at the Western Laboratory. This method of food preservation involves partial dehydration of fruits and vegetables to reduce their weight and bulk by about half, followed by conventional freezing. The potential economic advantage of the process over ordinary freezing is in the lower cost of packaging, transporting, and storing the finished products.

Dehydrofrozen apples have been found to meet quality requirements of pie bakers in every respect. Dehydrofrozen apricots have better flavor than frozen, canned, or dried apricots when baked into pies, and in appearance and texture they are equal to frozen apricots and better than either canned or dried apricots. Work has begun on dehydrofreezing peaches. The Laboratory previously reported that green peas can be dehydrofrozen successfully.

"Sirup filling" of apples for freezing, another process recently developed at the Western Laboratory, prevents browning of apple slices after freezing and makes them superior in flavor, texture, and "drip" characteristics to the conventionally prepared product. This treatment is particularly useful for soft-textured varieties to be used in pies.

Unusually heavy losses to the cucumber-pickle industry in 1947 and 1948, amounting to hundreds of thousands of dollars in the southeastern area alone, led processors to ask the Bureau's station at Raleigh, N. C., to aid them in determining the causes of softening of their stored brine stock. The Raleigh station developed a laboratory test which established that enzymes are responsible for the softening of brined cucumbers. This test makes it possible to detect the first appearance of enzymes in brine and identifies those which cause the trouble. It promises to reduce substantially the economic losses suffered by pickle manufacturers. Another result of the station's work was the isolation of a new strain of undesirable yeast, *Torulopsis caroliniana*, associated with gas formation, which also causes trouble for picklers. Work on a means of preventing the growth of this organism is continuing.

Industrial Uses for Midwest Farm Products

"Gelsoy," a versatile new protein product obtained from soybeans, has been developed at the Northern Regional Research Laboratory in Peoria, Ill. It is made by spray-drying the water extract of alcohol-washed soybean flakes from which the oil has been recovered with

hexane. Gelsoy is the first gelable vegetable-protein material so far discovered. It is bland in flavor and when dissolved in water has many of the properties of egg white. Laboratory tests show that Gelsoy makes a good remoistening glue and when used as a heat-sealing adhesive is water resistant. In trials by an industrial concern it proved satisfactory for sealing cork liners in metal bottle caps. It also has possibilities as a foaming agent. Gelsoy's whipping and gelling properties make it suitable for use in a wide variety of food products, including ice creams, gelled foods, and meringues. One commercial company, cooperating with the Northern Laboratory in research on this new soybean derivative, has constructed a small plant at Peoria for experimental production of Gelsoy.

A goal long sought by chemists—recovery of the sugar isomaltose in crystalline form from starch—was attained during the year by scientists at the Northern Laboratory. Working in cooperation with the Corn Industries Research Foundation, they have also perfected a method for preparing isomaltose in useful quantities. The availability of crystalline isomaltose for study by chemists and fermentologists is of great importance in developing wider uses for starchy crops. New starch products and improved processes for the industrial conversion of starch and cereal grains are expected to result from this achievement.

The Bureau's Enzyme Research Division, located at the Western Regional Laboratory, has succeeded in isolating the active principle of malt in pure crystalline form. This principle is the enzyme alpha-amylase, which is responsible for the ability of malt to convert starches to dextrins and sugars. Alpha-amylase and the so-called beta-amylase previously isolated by the Division from sweetpotatoes are the only two crystalline enzymes of this type so far recovered from plant materials. A better understanding of the action of alpha-amylase, now possible as a result of the Division's work, is expected to enable industrial concerns to improve their methods for manufacturing dextrins (starch derivatives used in adhesives, sizing materials, etc.) and other starch products from agricultural raw materials.

Straw Utilization

A revolutionary method for pulping straw has been developed at the Northern Laboratory. It is expected to provide a new impetus toward commercial production of straw pulps for fine and specialty papers, and it is also of interest to manufacturers of strawboard for boxes and packing materials. Called the "mechano-chemical process," it turns out as good pulp for strawboard, after the straw is cooked for only 1 hour at atmospheric pressure, as standard methods produce in 5 hours' cooking under 40 pounds pressure. Bleachable straw pulps for fine papers can be produced after only ½ hour of cooking with kraft-pulp chemicals at atmospheric pressure, contrasted with the 2 hours' cooking under 100 pounds pressure required in usual procedures. This development offers the possibility that wheat-straw pulp can be produced commercially at a cost competitive with softwood sulfite pulp.

New Products From Casein and Starch

Important industrial uses have been found for bristle fiber, made from milk casein, a development of the Eastern Regional Research Laboratory in Philadelphia. Hair cloth, used for stiffening the lapels of suit coats and for similar purposes, has been made successfully with casein bristle in place of horsehair. Machinery now employed to fabricate this cloth with horsehair can be used after slight modification to produce casein-bristle cloth. The stiffness of the new product can be varied widely, depending upon the diameter of the casein bristle.

About 300,000 pounds of horsehair are used annually in this country for stiff cloth, and the processed horsehair required is largely imported at a cost of several dollars a pound. Use of less-expensive casein bristle offers an economic advantage as well as the possibility of making the cloth in various grades of stiffness, as desired.

Casein bristle in curled, continuous-filament form is now being used in the manufacture of automobile-carburetor air filters. The curled filament is blended with wool, and the mixture is impregnated with an oil-like chemical (tricresyl phosphate) to improve its filtering action and then packed in disposable filter cartridges. This particular use for the filament is expected to provide a market for at least a million pounds of casein a year. Curled casein filament has good resilience and appears well suited for furniture stuffing and other forms of padding. Commercial upholsterers and furniture makers are testing it in various applications.

"Allyl starch," another product of the Eastern Laboratory, has aroused considerable industrial interest because of its outstanding properties as a base material for protective coatings, printing inks, linoleum, and other plastic compositions. Starch from various farm commodities can be used to manufacture this material, which is now in limited commercial production. However, some of its qualities—particularly water resistance and toughness—have needed improvement. The Laboratory recently found that a better product could be obtained by copolymerizing allyl starch with styrene (a chemical used in the manufacture of synthetic rubber). This development increases the resistance of allyl-starch coatings to certain solvents, alkalies, and boiling water and is expected to enhance the usefulness of allyl starch and to facilitate its further commercialization. The copolymer of allyl starch and styrene is cheaper than the original starch compound and compares favorably in quality with high-grade commercial coating materials, particularly for baked enamel finishes.

The Eastern Laboratory has developed a method for making lactic acid from whole potatoes. In this process the starch in ground, cooked potatoes is converted enzymatically to sugars, and simultaneously the sugars are fermented to lactic acid. No added nutrients are required, since potatoes have sufficient carbohydrate, protein, mineral, and other constituents to support the growth of fermentation organisms. This development makes it possible to convert surplus and cull potatoes into lactic acid at reasonable cost. The acid is an important chemical for the tanning, food, textile, pharmaceutical, and other industries.

Lactic acid is potentially valuable also as an intermediate for the preparation of elastomers, plastics, and plasticizers. About 200 million pounds of plasticizers, or softening materials, are used each year by industry. The Eastern Laboratory has developed a number of efficient plasticizers from lactic acid and devised simple, relatively inexpensive processes for their manufacture. One of the best of these products is butyl lactate adipate, prepared from butyl alcohol, lactic acid, and adipic acid, materials which are all readily available at fairly low cost. Lactic acid can be made easily and cheaply from many agricultural carbohydrate wastes and byproducts, and its use in plasticizers would furnish a large new outlet for these farm commodities.

Better Cotton Fabrics

A method for making cotton bags resistant to insects has been developed through cooperative research by the Southern Regional Research Laboratory in New Orleans and the Bureau of Entomology and Plant Quarantine. This work was done under the Research and Marketing Act. Fabric used in the new bags is treated with an insecticide (pyrethrum, used alone or mixed with piperonyl butoxide) which prevents penetration of the cloth by insects for as long as 8 months. The insecticide can be applied in the sizing of warp yarns or in the starching and filling of cotton fabric after it is bleached. Cost of the treatment is estimated at not more than 1 cent per square yard of cloth.

Considerable industrial interest has been shown in this development. The Textile Bag Manufacturers Association is conducting large-scale tests to determine the feasibility of making the treated bags commercially. Since paper has greater resistance to penetration by insects than untreated cotton, it has been replacing cotton in containers for flour, seed, and other farm products. The Southern Laboratory's insect-repellent cotton bag promises to improve cotton's competitive position in the container field.

Southern Laboratory scientists have taken an unusual approach to the production of water-resistant cotton fabrics: They are making practical use of the long-known fact that cellulose swells when wet. Recent Laboratory research has shown that the capacity of wet cotton fibers to seal the pores in a fabric is closely associated with the maturity of the fibers. Immature or thin-walled fibers show greater closing capacity than mature or thick-walled fibers, even though there is little difference in the swelling ability of individual mature and immature fibers.

The increased water resistance obtained in experimental fabrics made with immature cotton is even greater when the fabrics are given an extra-tight weave. An unsually tight fabric, 25 to 30 percent more dense than ordinary close weaves, can be produced with a special loom attachment developed at the Laboratory. Details of this weaving device have been furnished to a number of interested textile firms.

SCIENCE BUILDS ANIMAL INDUSTRIES

Forty-seven States are cooperating with the Bureau of Animal Industry in administering the National Poultry Improvement Plan,

and a major part of the hatchery industry of the United States (63 percent of the total egg capacity) is voluntarily taking part.

After 14 years of operation, the National Poultry Improvement Plan passed another milestone in its work to benefit both producers and consumers of poultry and eggs. The emphasis on controlling pullorum disease made it possible to drop the lowest of the four pullorum classes on July 1, 1949.

Due to the high incidence of the disease in flocks when the plan was begun, the Poultry Improvement Plan had officially recognized four classes of chicks for shipment from hatcheries: "U. S. Pullorum Tested," with up to 10 percent reactors; "U. S. Pullorum Controlled," less than 2 percent reactors; "U. S. Pullorum Passed," no reactors in the last test; "U. S. Pullorum Clean," no reactors in two or more consecutive tests.

When the plan was started in 1935, 4 million birds were officially tested for pullorum with an average of 3.7 percent reactors showing on the first test. In 1948, 30 million birds were tested with an average of less than 1 percent reactors on the first test.

On the basis of this fact, the "U. S. Pullorum Tested" class was removed from the list. In order to ship under an official label showing the pullorum class of chicks, hatcheries must now qualify for "U. S. Pullorum Controlled," with less than 2 percent reactors in the flock.

Better Keeping Quality of Eggs

For the last 9 years, the Department has conducted a series of poultry breeding experiments aimed at developing better keeping quality of eggs. The tests are based on the durability of thick albumen, an important factor in determining the quality of an egg.

Through selection and breeding, two lines of White Leghorns have been developed which lay eggs differing materially in the durability of the thick albumen. Under special heat-resistance tests, it was shown that the eggs of one line, called the "heat-resistant" line, hold more than three times as much thick albumen as those of the "non-heat-resistant" line. There is also a seasonal factor that appears in both lines, with eggs laid during the summer months showing a more rapid deterioration than eggs from the same hens during the fall and winter months. Matings this year were made only from breeding hens that have good quality heat-resistant albumin during all seasons of the year. All future matings will be made on this basis. This is expected to help raise the quality of eggs produced.

Hybrid Chickens

Continued research with hybrid chickens has brought forth evidence that points toward improved production and some evidence of greater disease resistance of hybrids over purebred chickens. The Bureau of Animal Industry has been comparing hybrids with purebreds for more than 10 years. Chickens produced by mating inbred Rhode Island Reds with inbred White Leghorns have consistently produced about 10 percent more eggs in their pullet year than outbred Reds or Leghorns. During the laying year, 1946–47, there was a 29-

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egg difference in favor of the hybrids. The following year, 1947–48, after an outbreak of Newcastle disease among the Bureau's experimental flocks, there was a difference of 45 eggs in favor of the hybrids. This may be an indication of greater hardiness of the hybrid chickens.

Such satisfactory results as these have increased demands of poultry producers for hybrid chicks to a point well above supplies. A little less than 10 million hybrid chicks were produced last year, and even though this production probably will be doubled in 1949, it will be only about 2 percent of average replacements in United States flocks.

State agricultural experiment stations cooperating with the Department in poultry breeding projects are: Arkansas, California, Colorado, Georgia, Indiana, Iowa, Kansas, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, North Dakota, Oklahoma, Oregon, South Carolina, South Dakota, Tennessee, Texas, Virginia, Washington, Wisconsin, and Wyoming. These States already have 63 inbred lines of chickens in development and considerable exchange of stock is taking place among the cooperating States.

Turkey for Frying

Fried turkey for Sunday dinner may rival the more common fried chicken as turkey broilers gain favor among poultry producers. Young turkeys also have been favorably received as small roasters. The breeding of the Beltsville White and Jersey Buff turkeys seems to be an element in the better outlook for turkey-broiler growing.

Turkeys reach the broiler or fryer stage about 2 weeks earlier than chickens and the desirable turkey broiler is larger than the chicken broiler—4½ pounds to 7 pounds for the turkey as compared with 3½ pounds for chicken on a live-weight basis. It takes only about 2.8 pounds of mash and grain feed to produce a pound of live turkey at broiler age, as compared with 3¼ pounds to 3½ pounds of feed to a pound of live chicken at broiler age. Offsetting this saving in feed is the somewhat higher poult cost of turkeys. Indications are that turkey broilers will have to sell for about 4 cents a pound more at the broiler stage to make as good a return as chickens.

There have been previous attempts in the direction of turkey-broiler production, but the dark-feathered breeds of turkeys grow too large to be practical for the purpose, have conspicuous pin feathers, develop practically no finish at fryer age, and the poults generally are higher priced. The Beltsville White seems to be exceptional among turkeys for its relatively quick maturity, combined with excellent meat conformation, including plenty of breast meat. It also ranks high in length of laying season, number of eggs produced, and their hatchability. Beltsville Whites are now produced in commercial quantities.

Poultry Vitamin B_{12}

A "mystery" vitamin necessary for poultry growth was identified during 1948. For the previous 5 years experiments had been conducted at Beltsville on the unidentified vitamin, present in the manure of cows and chickens and in fish meal, fish solubles, and liver. These studies led to the isolation by a biological laboratory of vitamin B_{12},

a bacterial growth factor required for early growth and reproduction of poultry. Experiments in injecting the crystalline vitamin into the eggs of hens fed a diet deficient in vitamin B_{12} resulted in improved hatchability of eggs and improved growth, viability, and feathering of chicks. Further tests in supplying B_{12} to the chicks of deficient hens did not improve viability and feathering. This emphasizes the importance of an adequate supply of the vitamin in the diet of breeders. In the past, supplies of vitamin B_{12} for animal feeds containing only vegetable proteins often have been grossly inadequate.

Progesterone in Poultry

The hormone, progesterone, has been discovered in the blood plasma of poultry. Heretofore, it had been recognized only in mammals. It is now certain that the hormone plays an important part in the development of the hen's egg. Further tests by the Department's scientists in collaboration with Yale University showed positive progesterone reactions in the male chicken, the first direct evidence of the occurrence of progesterone in the blood stream of normal males of any species. It seems probable that the compound exercises some specific function in the endocrine economy of birds.

Chicks Tested for Air Transport

Tests were carried out to determine just how high day-old chicks could be flown safely by commercial air lines. The principal factors studied were the rate of ascent, time the chicks were held at the high altitude, and the rate of descent. All tests were under simulated conditions at room temperatures of about 90° F. with continuous and adequate air flow. The experiments showed that day-old chicks can be flown at 20,000 feet for 16 to 20 hours, with rates of ascent and descent of 1,000 feet a minute for such long-time tests. Rates of ascent and descent could be increased to 5,000 feet a minute with no difficulties if the chicks were held at 20,000 feet for only 12 hours.

Newcastle Disease

Particular attention in the Department has been given to studies on vaccination for Newcastle disease affecting poultry. In one field experiment 81,000 birds on a commercial broiler farm were used in an experiment to test vaccines. Results obtained in these experiments with live-virus vaccine have been quite encouraging in controlling the disease.

There are several drawbacks, however, to the product. One is that all susceptible birds on the premises involved must be vaccinated at the same time. If this is not done, the vaccinated birds can spread Newcastle disease to the unvaccinated susceptible birds. If the virus is introduced into a laying flock by vaccination, it will cause a complete interruption of egg production for several weeks, just the same as though the birds had experienced the naturally occurring disease.

Cross-Breeding Beef Cattle

Experiments in cross-breeding beef cattle, conducted at the United States Range Livestock Experiment Station, Miles City, Mont., showed

a better record of vigor, gain, and quality for the crossbred than for the purebred. Breeds used in the tests were Shorthorn, Hereford, and Aberdeen Angus. Crossbred females were excellent range cows. They were high in fertility and milk production and produced heavy calves at weaning time. The second and third generation calves appeared to profit as much from being out of crossbred cows as from being crossbred themselves. Because of the discrimination of feeder buyers against crossbred cattle with mixed colors, range producers who feed their own steers or sell direct to feeders are the ones likely to gain the most from cross-breeding.

Bovine Mastitis

Although considerable progress has been made in developing means of combating bovine mastitis, it is still considered to be one of the most serious diseases of dairy cattle from an economic standpoint. For this reason, the Department's research workers are continuing efforts to find more effective methods of controlling the disease. These efforts have been directed generally along two lines of research: (1) A study of the causes of the disease so that a dairyman can better protect his cows from becoming infected; and (2) to discover better methods of treating cows which have contracted mastitis.

Results of an earlier study indicated that the spread of chronic mastitis could be prevented by following reasonable practices in milking and handling the herd. These practices include stabling clean cows together at one end of the milking line and milking them before milking infected cows, and thoroughly cleaning and sterilizing the milking machine between milkings.

Experiments were conducted to test the efficiency of two new antibiotics—subtilin and bacitracin—for treating clinical cases of mastitis. In view of the outcome of the experiments and the results obtained by other investigators, it is believed that the agents now generally available—such as penicillin, sulfanilamide in oil, and tyrothricin—are still the most effective treatments for the common forms of mastitis.

X-Disease

Further surveys of the baffling "X-disease" in cattle have confirmed earlier reports that the malady causes heavy death and other economic losses among infected herds. A group of United States Department of Agriculture scientists studied 26 herds in 5 Southern States, where the disease caused an average loss per herd of about $4,200. Thirty-one percent of the cattle in the herds had been affected.

The source of the disease, sometimes called hyperkeratosis, has not yet been isolated, but several possibilities have been tested and rejected. One survey has indicated that X-disease does not result from poisoning by a specific plant. In reply to other queries, the Bureau of Animal Industry stated last April that DDT does not cause X-disease in cattle or a similar disease in man. Both of these diseases were recognized before DDT was used as an insecticide. Other possibilities still being explored are (1) an infective agent such as a virus or fungus, (2) a poisonous mineral, or (3) a nutritional imbalance.

The disease has not yet been shown to be infectious since attempts to transmit it experimentally have not been successful so far. The normal course of the disease runs from several weeks to 3 months. Young stock appear to be more susceptible than older animals. Severely affected animals usually die.

Phosphorus to Range Cattle

The Department announced in August the results of experiments begun in Texas 5 years ago to find methods of supplying phosphorus to the diet of range cattle. It had been discovered that cattle showing a craving for bones, dirt, wood, and other such material lacked phosphorus in their forage. They became thin, weak, and stiff. As a result of the Texas experiments, the Department has issued three recommendations for supplying the necessary phosphorus: (1) By feeding the cattle bonemeal, (2) by treating drinking water with disodium phosphate, and (3) by fertilizing the grazing range with triple superphosphate. The experimental use of any of the three methods resulted in larger calf crops and heavier calves at weaning time.

Intestinal Threadworms

The Department's experiments with the effects of intestinal threadworms (*Strongyloides papilosus*) upon grade Jersey calves showed the parasite to be more destructive than had been believed heretofore. Such infestations had been considered relatively harmless, but when clinical symptoms were produced in nine calves, six of them died as a result of exposure to massive doses of larvae. It was found that calves were infected more easily when the larvae of the parasites were placed on the skin than when they were administered through the mouth. The most noticeable effects of this parasite were intermittent diarrhea, loss of appetite, and retarded growth. Severely infected calves made daily weight gains which were 43 percent less than those of uninfected controls.

Crossbred Sheep

At Dubois, Idaho, studies of the advantages of lambs from line crosses over those from inbred lines were continued during the year. The lines used for crossing were above average for every trait, including face covering, staple length, weaning weight, type, and condition. Cross-line lambs were superior to their parent lines in each of these traits, ranging from a 2-percent gain for staple length and face covering to 5 percent for weaning weight, 7 percent for condition score, and 9 percent for type score.

In experiments at the Beltsville Research Center, cross-breeding of representative down-breeds increased wool production over that of parent lines. The Hampshire-Shropshire cross produced 4.55 pounds of clean dry wool, the Shropshire-Hampshire cross yielded 3.98 pounds, and the crossbreds produced by mating a Hampshire ram to a Southdown ewe yielded 3.80 pounds per fleece per year. In the test, purebred Southdowns produced only 2.33 pounds of clean wool per fleece, the purebred Shropshires 3.6 pounds, and the purebred Hampshires 3.1 pounds.

Hybrid Hogs

Research in producing a new-type hog has progressed to the point where herd sires from the Beltsville Research Center are being given farm trials. Hybrid sires from 6 foundation lines are being tested in about 20 States. Boars are sold outright to farmers, who in turn agree to keep records of daily gains and market weights. These records are returned to the Research Center for study. Early results of the tests show that hybrid pigs raised on the farm produced a high percentage of preferred cuts that brought a premium over the market price.

Records of the Bureau of Animal Industry show that of the new strains being developed at Beltsville, the Landrace-Poland China and Chester White-Landrace inbred strains produced the largest and the same average proportion (48.9 percent) of the five important commercial cuts—ham, loin, bacon, picnic shoulder, and shoulder butt—based on live weight, at time of slaughter. The Landrace-Large Black strain was next in yield of these cuts.

Montana No. 1 Hog

An announcement was made during the year establishing the Montana No. 1 (Black Hamprace) hog as a new breed. This hog was developed from crosses made in 1936, with distribution now averaging about 55 percent Landrace and 45 percent Hampshire, and a coefficient of inbreeding of about 32 percent.

Records over a 9-year period show that the new hog averages about 10.6 pigs per litter at birth and 8.1 pigs per litter at weaning. The average gain for pigs fed from weaning to a market weight of about 225 pounds has ranged from 1.13 to 1.69 pounds per day. Development of the Montana No. 1 hog was a joint project of the Montana Agricultural Experiment Station and the Bureau of Animal Industry.

Internal Parasites Increase Cost of Pork Production

Studies on the effect of internal parasites on pork production, begun in 1941, were completed during this fiscal year. In cooperation with the Georgia Coastal Plain Experiment Station, the Department conducted experiments that relate the parasite infestations to the feed consumption and growth of pigs.

From three to six litters were farrowed each spring and fall under conditions conducive to infestations of the parasites that are common to the coastal plains area of Georgia. Most of the retarded growth of moderately to heavily infested pigs occurred during the suckling period. After they reached a weight of about 50 pounds, these pigs gained as rapidly as those that were only lightly infested with parasites. But, with their growth retarded early in life, the heavily parasitized pigs took from 4 to 5 weeks longer to reach a weight of 225 pounds. They consumed about 46 percent more protein and mineral supplement than the pigs only lightly infested with parasites, thus showing the increased cost of pork production from heavily infested herds.

Foot-and-Mouth Research

During the year, research on foot-and-mouth disease has been continued on an international basis. The Bureau of Animal Industry has administered a program for this country as part of the Mexican-United States Commission to conduct research and an action program to work toward control of the severe outbreak of foot-and-mouth disease in Mexico. At the same time, work has been expanded in the cooperating European laboratories, and observations made in Europe have been made available immediately for use by the Commission's vaccine-production division in Mexico.

By midsummer, 1949, laboratory facilities had been increased to allow the Commission to produce more than 2,000,000 doses of protective vaccine every month to be used in continuing the campaign in Mexico. With this production, it was possible to complete the first round of vaccinations of all susceptible animals in the quarantine zone early in August.

First-round vaccinations covered a total of 13,071,533 cattle, sheep, goats, and swine. Second and third rounds were started close behind.

Special serums have been prepared in Europe and at the Animal Disease Station, Beltsville, Md., and shipped to Mexico. This coordination has provided a means for rapid differential diagnosis of vesicular conditions in animals in Mexico, and thus has been of considerable help in the control program.

Studies conducted in England and Holland have given valuable aid to the vaccine production in Mexico. Cooperative research in Holland has brought about a modification of the tissue culture technique developed by Dr. Frenkel, Director of the Netherlands Foot-and-Mouth Disease Research Laboratory, Amsterdam, Holland. The new modification has resulted in a 100-percent increase in foot-and-mouth disease virus yield to be used in vaccinations. An attempt will be made to use this modified technique in Mexico during the coming year.

An appropriation of $500,000 has been made available to the Bureau of Animal Industry for the preparation of plans, specifications, and cost of estimates for establishing a foot-and-mouth disease research station on a coastal island under United States jurisdiction.

In order to obtain advice in developing a policy for the establishment of facilities for such research in this country, consultations have been held with the following authorities: Dr. Frenkel of the Netherlands; Dr. Fogedby, Director of the Danish Foot-and-Mouth Disease Research Laboratory, Lindholm, Denmark; Dr. Galloway, Director of the British Foot-and-Mouth Disease Research Laboratory, Pirbright, England; and Dr. Moosbrugger, Director of the Swiss Foot-and-Mouth Disease Research Laboratory, Basle, Switzerland.

Benzene Hexachloride Safe for Controlling Animal Parasites

The use of liquid preparations of benzene hexachloride, applied to hen-house roosts, has been highly effective in the destruction of the body louse and the fluff louse on poultry. Repeated tests, continued

for 25 days after such application, showed no undesirable odor or flavor of eggs or flesh of birds using the treated roosts.

The Department also found that red mite infestation was completely eradicated by two applications of benzene hexachloride applied in the hen house with hand pumps. But because there is likely to be some trace of odor and taste of the chemical in the flesh of the birds when large quantities of the preparation are used in this manner, the procedure is not recommended for use in poultry houses when the birds are to be slaughtered in the near future.

Other Department tests have shown that benzene hexachloride, applied in a single dip in cold water, is highly effective against infestatations of the common scab of sheep. It is an inexpensive and easy method to use, particularly when compared with the complicated dips used heretofore, that require two or more dippings. The benzene hexachloride dip is adequate under ordinary conditions for use on average farm flocks.

It is satisfactory during early summer and midsummer, and it is effective on recently shorn sheep as well as on animals in full fleece. Lambs may be slaughtered for food purposes at any time after 3 weeks, and certainly 4 weeks, following dipping in 0.06 percent of gamma isomer benzene hexachloride, with no objectional flavor or odor.

A single dipping in suspensions of benzene hexachloride of low gamma isomer content affords excellent control of goat lice. The preparations used are inexpensive, readily obtained, easily used on the farm, and completely harmless to goats. This treatment should not be used on milk goats because of the possible danger of contaminating the milk with the chemical.

One dipping in benzene hexachloride suspensions containing 0.06 percent gamma isomer eradicates infestations of lice on swine. The treatment is effective on newborn pigs.

Surveys of Anthrax and Rabies

A national survey to determine the incidence of anthrax in livestock for 1948 revealed that 120 outbreaks were reported from 14 States, involving 63 counties with a total loss of 1,654 head of livestock. This is a greater number of outbreaks than for 1945, but a little less than for 1946 or 1947. During the early part of 1949, outbreaks of anthrax were reported from Alabama, Arkansas, Indiana, and Nebraska.

A similar survey or rabies in the United States for 1948 showed 8,508 cases in all species of animals including man. There were 6,610 cases reported in dogs, 599 in cattle, 34 in horses, 14 in sheep, 36 in swine, 378 in cats, 5 in goats, 819 in miscellaneous animals (mostly wild), and 13 in man. The total number of cases shows a decrease over 1947 and is considerably less than for any year since 1942.

DAIRY CATTLE BREEDING

Cross-breeding of dairy cattle by the Bureau of Dairy Industry, now in the tenth year at Beltsville, Md., continues to show progressive improvement in production. Records are available for 54 two-breed

cows and 41 three-breed cows, including a few four-breed cows and second-cycle three-breed cows.

The average production of the 54 two-breed cows, at the average age of 2 years 2 months, was 13,006 pounds of milk and 585 pounds of butterfat. The average production of the 41 three- and four-breed cows, at the average age of 2 years 1 month, was 13,465 pounds of milk and 606 pounds of butterfat. The final average is an increase of 3,327 pounds of milk and 164 pounds of butterfat over the average of the purebred foundation cows. These results indicate that a high level of production may be reached in a comparatively short time, and maintained, by using good proved sires regardless of the breed of the cows.

The phenomenal growth of the artificial-insemination program for breeding dairy cattle has brought a heavy demand for young bulls from the Beltsville herd because of the high production inheritance built in this herd through the continuous use of proved sires. A total of 83 Beltsville-bred bulls (Holsteins, Jerseys, and Red Danes) are now in artificial-breeding service, and it is expected that 35,000 cows will be bred to them this year. In this way the good inheritance of the Beltsville herds is being used widely to improve the general dairy cattle population.

Several years ago, the Bureau of Dairy Industry announced that the stage of mammary-gland development in young heifer calves was a fairly reliable index to their future milk-producing ability. Further research on a more comprehensive scale and with greater numbers of animals has confirmed previous results. The size and stage of glandular formation in the young calf's udder is determined by feel (palpation), and the udder is then given a grade indicating whether it is advanced or retarded, as compared with the average for the breed. In the Bureau's herds, cows that were advanced in mammary development when they were calves have produced from 2,500 to 4,000 pounds more milk than those that were retarded at the same age.

This method of predicting future producing ability has attracted world-wide attention, and it has been demonstrated to representatives of numerous foreign countries as well as agricultural workers in this country. Before the method can be recommended for general use, however, it must be tested in a large number of herds of varying levels of production. Such tests are now under way on a limited scale through Federal regional projects and State cooperation.

In other anatomical studies, it was discovered that southern cows have much smaller thyroid glands than northern cows of the same age and breed. As milk production in the Southern States averages about 25 percent less per cow than in the Northern States, this discovery should be of special interest to research workers and others seeking an explanation for this relatively low production. Secretions of the thyroid gland are known to perform an important function in the utilization of feed.

Dairy Cattle Feeding and Nutrition Studies

Feeding experiments by the Bureau of Dairy Industry in cooperation with the Montana Agricultural Experiment Station showed that some labor was saved by feeding dairy cows only once a day, but the

cows ate less hay and produced less milk than when they were fed twice a day. Consumption of grain and corn silage was about the same under both systems of feeding.

In another feeding experiment, conducted in cooperation with the North Carolina Station, a concentrate dairy mixture consisting entirely of byproducts from southern crops produced as much milk as a standard mixture containing 70 percent of grains, and cost less. The byproduct mixture was dried citrus pulp, dried sweetpotatoes, peanut meal, and cottonseed meal. The standard grain mixture was ground corn and oats, wheat bran, and cottonseed meal.

Although pastures usually are the most neglected crop on the dairy farm, they will furnish nutrients cheaper than any other crop if they are maintained at a high level of productivity. Research by the Bureau of Dairy Industry shows that renovation of old and unproductive permanent pastures is an excellent method of increasing yields. Over a period of 4 years, renovated pastures at Beltsville, Md., averaged 3,560 pounds of total digestible nutrients per year, or an average of 29 percent more than the 2,765-pound TDN yield from an unrenovated pasture used for comparison. The renovation process consists of applying manure, lime, and commercial fertilizer, disking thoroughly, and seeding with an approved pasture mixture.

A 5-year crop-and-pasture rotation experiment begun at Beltsville several years ago indicates that more roughage and more total digestible nutrients can be obtained from this rotation system than from permanent pastures. Corn and wheat are grown the first 2 years, and grasses and legumes the following 3 years. On the average, this rotation has yielded 11 percent more nutrients per acre per year than permanent pasture. Furthermore, the crops in the rotation series provide grazing in early spring and late fall, when pasturage normally is short.

Because forages harvested as wilted silage and barn-dried hay are not exposed to the sun as long as field-cured hay, it generally has been assumed that these feeds contain little, if any, vitamin D. However, tests this year by the Bureau of Dairy Industry showed that all barn-dried hays and wilted silages, when produced under conditions similar to those at Beltsville, will provide enough vitamin D to protect calves from rickets if fed in adequate amounts.

Experiments by the Bureau of Dairy Industry during the past 4 years indicate that dairy farmers can raise good heifer calves for herd replacements cheaper by feeding them more good-quality roughage. After a 10-month period on good roughage and limited amounts of grain, a large number of heifers have been raised to calving age on alfalfa hay alone or on various combinations of roughage as follows: Alfalfa hay with corn silage; alfalfa and timothy hay with either corn silage or corn-stalk silage; and alfalfa and timothy hay with a mixture of orchard grass and Ladino clover hay. All heifers have been normal in weight at 24 months of age, and all have calved normally. Such a feeding schedule would be of special value in a grassland-farming system, where the principal crops are hay and other roughages that must be disposed of by feeding livestock.

Protein requirements for dairy cows may need to be revised downward, according to research by the Bureau of Dairy Industry. Now, it appears safe to recommend from 3 to 4 percent less protein in the

grain mixture than was previously recommended for average farm cows.

Thyroprotein, a synthetic feeding material known to induce cows to give more milk for a short time, is now on the market, and some dairymen are feeding it without questioning either the economy of milk production over longer periods or the ultimate effect on the health of the cows or the offspring. Research on the merits of this material has been in progress in the Bureau of Dairy Industry for several years. The results, although not yet conclusive, indicate some undesirable effects from prolonged feeding of thyroprotein.

Research in the Bureau of Dairy Industry this year showed that pure crystalline vitamin B_{12}, which is the name commercial chemists gave to the anti-pernicious-anemia factor they isolated from liver in 1948, has the same physiological effects in normal mammals as the unidentified growth factor (nutrient X) which Bureau workers had previously found in milk, skim milk, nonfat milk products, and certain other foods. Unlike pure vitamin B_{12} or liver extracts, however, milk and other food sources of nutrient X are not effective in treating pernicious anemia, probably because of the form in which the factor exists in these foods. Studies will be continued to determine the form in which the vitamin B_{12}-active material occurs in milk products, and particularly to determine the mechanism by which it influences the ability of mammals to utilize protein.

Milk and Dairy Products Investigations

A new-type milk heater designed and built by the Bureau of Dairy Industry several years ago, for use in studying the effect of high-temperature, short-time heating procedures, was further improved this year and demonstrated to the dairy manufacturing industry. In addition, a new-type flow-diversion valve was developed and demonstrated for use with various kinds of milk-heating equipment or pasteurizers. The valve prevents the discharge of any inadequately heated milk by automatically diverting it back to the heating unit.

At least two commercial companies now plan to manufacture the heater, and others have adopted certain features of both the heater and the flow-diversion valve to modify present equipment. The design of the heater is such that it could easily be adapted for use as a pasteurizer in small market milk plants or cheese factories, where less expensive equipment is needed.

The Bureau of Dairy Industry's improved phosphatase test for determining the adequacy of pasteurization of cow's milk, and in dairy products made from cow's milk, has now been modified for use with goat's milk. Although still not as sensitive as the cow's milk test, the goat's milk test is considered sufficiently sensitive for all practical purposes. A reliable pasteurization test for goat's milk is especially important because of the frequency of brucellosis organisms in the raw milk.

In other experiments with goat's milk, the Bureau found that the commercial supply can be extended through the winter by pasteurizing, homogenizing, and freezing the milk, and holding it in frozen storage at temperatures between −17° and −27° C., temperatures which are

practical for commercial use. Goat's milk is produced normally only from March to October.

Dairy scientists are gradually finding ways to improve the flavor and body stability of milk that has been preserved by frozen storage, which should aid in conserving milk produced during the flush period and in extending the market to areas where milk supplies are inadequate or not otherwise available. The Bureau of Dairy Industry has found that the addition of ascorbic acid (vitamin C) to the milk before freezing it retards the development of an oxidized flavor—a flavor defect that has retarded the commercial development of the frozen-milk industry. Various processing modifications have been investigated. The results indicate that the normal flavor of the frozen product is retained longer if the milk is separated and the skim milk and cream are pasteurized separately, and then mixed, homogenized, and cooled. Higher pasteurization temperatures than are normally used will increase the flavor stability of the reconstituted product.

Experiments by the Bureau of Dairy Industry indicate that the keeping quality of dried milk can be improved by subjecting it to carbon dioxide under pressure before sealing it in cans. The present commercial procedure is to evacuate the air for about an hour and then let nitrogen in to restore atmospheric pressure before sealing the cans. The substitution of carbon dioxide for nitrogen in this procedure gave improved keeping quality, but even better results were obtained by forcing the carbon dioxide in until it built up a pressure of 50 pounds, holding at that pressure for 3 hours, then releasing it and sealing the cans.

THE FOREST SITUATION

Our goal in forestry should be to make the forest lands of this country capable of serving the national welfare permanently and abundantly. With improved management the productivity of our forest lands can be built up so that ultimately they cannot only supply our own future requirements on a permanent basis, but also can contribute in some measure to the welfare of other peoples of the world.

We have a big job ahead to achieve that goal. Our forests are still operating in the red. The supply of all-important saw timber is steadily shrinking. Many forest ranges are run down. Critical watershed problems exist in many areas.

We need to restore millions of acres of depleted forest and range land to productivity. We need to build up our timber-growing stock. We need to bring about good management of all forest lands. We need to safeguard watershed values and improve deteriorating watersheds. To attain the full benefits of our forests we should also develop opportunities and facilities for recreation, preserve scenic values, maintain forest wildlife resources.

It is necessary that we protect and wisely use the forest values we still have. Millions of acres of forest land in the United States still lack any form of systematic protection against fire. Fire control forces and facilities are far from adequate on many other areas. Organized fire protection should be strengthened and extended as rapidly as possible to all areas needing it.

More adequate protection should be provided against destructive forest insects and diseases. Every effort should be made to reduce waste in the utilization of forest products.

An urgent need is to stop destructive cutting. The Department of Agriculture has recommended measures to prohibit the premature or wasteful cutting of timber in young stands, and to require the reservation of sufficient growing stock to keep forest lands reasonably productive. The Department's recommendations would give ample opportunity for such controls of timber cutting and related practices to be applied by the individual States, but in conformity with Nation-wide standards to be set by National legislation. The Federal Government would provide financial assistance to the States in applying such control measures under State laws and it would be authorized to apply them directly in any State which requested it or failed within a reasonable time to take the necessary action on its own.

Such measures are needed promptly to check further destruction and deterioration of forest resources. Beyond this is the need for positive action to restore and build up our forests for full production and service.

Present Federal-State cooperation to provide on-the-ground advice and technical assistance in forest management is reaching only a small fraction of the more than 4 million owners of commercial forest land in this country. Expansion of this cooperative service is much needed, especially for farmers and other small woodland owners. Some 261 million acres—three-fourths of all private commercial forest land in the country—is in small holdings, averaging 62 acres each.

Other cooperative aids that would help to encourage better forest management include public assistance in the establishment of co-operative management and marketing associations, provisions for long-term credit to forest owners, and provision for insurance on growing timber. Improved systems of taxation of forest lands would decrease the pressure in some States for quick liquidation of growing timber.

Millions of acres of idle, submarginal farm land and nonproductive woodland need planting to bring the land back to productivity. Tree planting also is needed to improve watershed conditions in many areas. Present reforestation programs, both on public and on private lands, are far from adequate in relation to needs.

Several million acres of national forest range land need reseeding, as well as large areas of other public and private range land in the Western States. Other range improvements, such as stock-watering facilities, fences, and eradication of useless or noxious weeds, can contribute to building up deteriorated range by making possible better control and distribution of livestock grazing.

Back of all such action for the restoration and development of the forest and range resources should be continued, aggressive research. Sound knowledge is a requisite for sound action.

Problems in Forest Management

Getting satisfactory regeneration of desirable kinds of trees after the mature timber is cut is an important problem in forest management. During the past year, research men at the Bent Creek Experi-

mental Forest in North Carolina demonstrated that seeding establishment of pines is improved when logging slash is removed and the forest litter decreased by burning or scarification. Small openings in a short-leaf pine-hardwood stand were stirred up by dragging a stump behind a small tractor. By midsummer there were 28,000 seedlings per acre in treated openings and only 6,000 in untreated ones. In the loblolly pine type of the Piedmont, fewest seedlings came in when slash and litter were undisturbed. Establishment was better when slash was removed, and best of all when the soil was exposed. Similar results were obtained with pitch pine in New Jersey. At the Crossett Experimental Forest in Arkansas, however, a bumper seed crop was followed by a satisfactorily dense stand of seedlings without any treatment of the ground. Under conditions in that forest, litter averaging 1.3 inches in depth does not seriously interfere with regeneration, if there is a generous supply of seed.

Pruning has important possibilities for improving the quality of second-growth timber. At the Pacific Northwest Station, most promising crop trees in a thinned 36-year-old Douglas-fir stand were pruned to a height of 19 feet at a cost of 35 cents each. Calculations indicate that the increase in value resulting from growing clear material in the pruned trees will bring a profit several times greater than costs.

Applications of Forest Research

At the Southeastern Forest Experiment Station, bud pruning of slash pine gives promise of being a cheap and effective way of producing lumber free from knots. Pruning of this kind is begun when the trees are 3 to 6 feet high. The work can be done at the rate of about 3½ feet per minute and costs less than ordinary pruning. Height and diameter growth have not been affected by the first 2 years of bud pruning. Pruned trees are more resistant to glaze damage and may suffer less from fusiform rust.

At the Alexandria, La., Research Center, survival of seedlings planted with one of the new planting machines was found to be as satisfactory as that of seedlings planted by the best hand methods. On favorable terrain, these machines cut planting costs from one-fourth to one-half those of hand planting. The Gulf Coast Research Center in Mississippi found that the use of chemical weed killers in a tree nursery reduced by 75 percent the man-days of labor needed for hand weeding. Weeding has been one of the costliest items in raising planting stock. At the Lake States Forest Experiment Station it was learned that nursery weeds can be killed most easily by chemical sprays when they are small. There is indication that seedbeds may be treated before sowing to kill soft-coated or newly germinating weed seeds. It is estimated that chemical weeding of tree nurseries, if generally adopted in the Lake States, will save as much as $40,000 a year.

Research in range management continues to demonstrate the benefits of stocking the range conservatively. At the Desert Experimental Range in western Utah, two bands of ewes were winter-grazed for 8 years on a salt desert shrub type of range, each band being grazed in alternate winters on adjacent areas stocked conservatively and heavily. The ewes on conservatively grazed ranges produced fully

a pound more wool per head annually and were 12 to 20 pounds heavier at the close of the winter grazing season. Death loss from undernourishment was practically eliminated on the conservatively stocked area, whereas 3 to 5 percent death losses were experienced year after year on the heavily stocked range. Lamb crops were 8 to 13 percent higher, supplemental feeding costs were almost eliminated, and care of poor sheep and costs of handling them were greatly reduced on the conservatively grazed range. Increased returns from conservative stocking amounted to approximately $1.75 per head.

Several years of cooperative study by the Forest Service and the Bureau of Animal Industry at the United States Range Livestock Experiment Station in southern Idaho resulted in better management guides for sheep grazing on spring-fall range. The study showed when spring grazing can be started without damage to the range, as well as the dates when the nutritive values of the principal forage plants become too low for sustained growth of the lambs and the sheep should be moved to higher ranges. It was shown that spring-fall ranges should be stocked at a rate low enough to provide adequate forage in all but extreme drought years. With this level of stocking, 50 to 60 percent of the herbage of the fine-leaved grasses should be left after spring grazing and 30 to 40 percent at the end of fall grazing. This level will assure maintenance of plant vigor during good and poor years alike, so that the range productivity will be maintained. Rotation or deferred grazing should be practiced and so planned that no range unit is grazed during the same part of the spring in consecutive years.

Study of Wood Sugars

The Forest Products Laboratory at Madison, Wis., in cooperation with the University of Wisconsin, is continuing its work with wood sugar, the basic product of wood hydrolysis. The Madison wood-sugar process offers promise of converting great quantities of waste wood into stock feed molasses. Feeding tests under way during the past 2 years through the cooperation of a number of agricultural experiment stations and universities have shown wood molasses to be acceptable high-energy stock feed for dairy and beef cattle, hogs, sheep, and poultry.

Wood sugars have been transformed into another type of feed, a yeast, that is being tested with poultry. Yeast fermentation on these sugars has been developed into a continuous process. The product is high in vitamin B content.

Implicit in much of the Laboratory's research in chemical wood conversion has been recognition of the fact that this general field of investigation offers much hope of utilizing the residues in normal harvesting and utilization of wood. These residues, occurring as they do all along the line from logging in the forest through milling and fabrication, represent enormous losses of wood fiber. On the other hand, as most woods operations and conversion plants are comparatively small, processes designed to utilize their wastes must be adaptable to use on a relatively limited scale. The wood-molasses research, therefore, has been directed toward development of plants capable of

economic operation in connection with small wood-working mills and factories, or with woods thinnings as the raw material in areas where farm woodlands and cut-over forests contain such stock.

Fiber-Building Boards

Another development of this kind has been research aimed at small-scale production of fiber-building boards. A process has been developed that employs relatively simple milling procedures and forming and drying equipment for small plants that can utilize the sawdust, shavings, slabs, and other refuse of milling and woodworking establishments. During the past year, fiberboards have been supplied to manufacturers of furniture for tests as core stock, wood for which is in short supply.

The Forest Products Laboratory assisted the Rural Electrification Administration in developing pole-treating specifications applicable to new species, treatments, and preservatives that have come into use for poles since the war. A study of the length of service to be expected in various parts of the United States for poles and other products treated with the newer preservatives was started this year.

Studies on the deterioration of jack pine and southern pine pulpwood during storage are providing information that may save the pulp and paper industry large sums of money by indicating the optimum storage time from the standpoint of economics and pulp quality.

These are a few examples of many forest research activities that are yielding important new information, looking to improved forest management techniques and more efficient utilization of forest products.

HUMAN NUTRITION AND HOME ECONOMICS

Food is plentiful in the United States and industrial goods are available in great variety and quantity. But the physical and economic well-being of the Nation's families depends in large part on how they use available food, textiles, and other goods and services. A study by the Bureau of Human Nutrition and Home Economics shows the kinds and quantities of food purchased by urban families in the spring of 1948. Urban families the country over were then spending one-third of their income for food. On the average, they devoted 32 percent of this food money for meat, fish, poultry, and eggs; 16 percent for milk and its products other than butter; 21 percent for fruits and vegetables; and 31 percent for all other foods, including grain products, fats and oils, sugars, sweets, and accessories.

Families with annual incomes above $7,500 used about two-thirds more milk and meat, over twice as much fresh fruit, and almost 10 times as many frozen fruits and vegetables as did families with incomes under $2,000. Both high- and low-income families were using more milk than in the spring of 1942, when the previous comparable Nation-wide study was made. Low-income families between 1942 and 1948 increased their consumption of foods eaten at home relatively more than did high-income groups, particularly of meat, fish, poultry, and eggs.

Comparisons among four cities studied in the winter of 1948 brought out contrasts in food choices. Families in Birmingham, for example,

bought comparatively large quantities of fats, flour, other cereals, sugars, and sweets. Families in Buffalo, Minneapolis-St. Paul, and San Francisco purchased relatively large amounts of fresh milk, meat, and potatoes.

These patterns of food consumption varied with incomes and community standards and traditions. They also reflected the influence of educational programs based on research.

To help provide scientific information for educational programs the Bureau studies the composition and nutritive value of food and home methods for preparing and preserving food. Teachers, scientists, dietitians, and physicians, as well as administrators of governmental programs both national and international, use the Bureau's data on food composition. Increasing numbers of individuals write for information on the nutritive value of diets or of specific foods. These inquiries reveal wide interest in the caloric value of foods. Questions about the composition of foods cover a wide range of products. Often the questions concern unusual foods on which information is not readily available, and require considerable search of the world's scientific literature.

Laboratory research in the field deals largely with the protein and vitamin content of foods, and with the utilization of these nutrients by the body. Adequate quantities of the right kinds of proteins are essential to good human nutrition. The secret of their role in human diets lies in the amino acids, the building blocks of which proteins are made. Hence research aims to determine what amino acids make up the various proteins, which of these acids are essential to human nutrition, and what quantities of each are present in different kinds of foods.

Feeding experiments with laboratory rats have shown that the sulfur-containing amino acid, lanthionine, can replace cystine and methionine, the two other known sulfur-containing amino acids. Lanthionine was first discovered by Department chemists among the hydrolysis products of wool. It has since been found in several proteins, including lactalbumin, one of the proteins of milk. Of two forms in which it has been isolated, the racemic and the meso, only the former can be utilized for growth.

The nutritional effectiveness of foods depends in part on their distribution in the day's meals. With adult women as subjects, the Bureau in a 2-year experiment compared blood-sugar levels following eight different types of breakfasts. The breakfasts varied from black coffee only to citrus juice, bacon, and eggs or milk (in equi-protein amounts), toast, butter, jam, and coffee with cream and sugar. Following breakfasts of relatively high protein content derived in part from milk or eggs, the subjects reported a high sense of well-being. Their post-breakfast blood sugar returned to fasting levels much more slowly than after breakfasts that provided the same caloric value but less protein. Highly significant and heretofore unreported seasonal differences were found in blood-sugar levels, the highest occurring in winter.

Vitamin research has benefited from recent improvements in microbiological procedures for the quantitative determination in foods of folic acid. This recently identified vitamin of the B-group is essen-

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tial to growth, to the formation of blood elements, and to proper metabolism. By the improved analytical methods, the Bureau has added to knowledge of the quantitative distribution of this vitamin.

Tests of Home Cooking Methods

How far will a cut of meat go in feeding a family? The Bureau looked into this question in testing different home methods of meat and poultry cookery. It found that roasting chickens yielded more cooked muscle meat in proportion to dressed weight than did stewing hens. But the weight of the cooked edible portion of stewing hens was increased by cooling the chicken in the broth in which it had been cooked. Pot roasts of beef, cooked both with and without water, yielded proportionately more cooked muscle to raw in the fatter cuts. The addition of water reduced the yield relatively less in the fatter cuts than in the leaner ones. These results indicated need for research on the adaptation of cooking methods to fatness in beef.

The nutritive value as well as the yield of foods may be affected by cooking. The protein of commercial soy grits was improved in nutritive quality by cooking it in moisture for 15 to 30 minutes. Longer cooking, however, was disadvantageous—protein quality did not improve further and the thiamine content declined. Longer cooking did not produce any measurable change in riboflavin and niacin values.

In a study of the relative merits of different methods of home food preservation, the Bureau found home-frozen snap beans to be superior to home-canned beans in palatability, appearance, color, and nutritive value. Prepared for the table after being stored for 10 months, the frozen samples retained 76 percent of the thiamine and 29 percent of the ascorbic acid of the fresh raw products; while the canned beans retained 70 percent of the thiamine and 15 percent of the ascorbic acid. Samples studied were from four successive plantings of Fulcrop snap beans, a full-podded stringless variety recently developed by Department scientists.

Dehydration Experience Reported

A comprehensive technical report gave permanent form to the results of wartime studies of ways to improve the flavor, texture, color, and nutritive value of home-dehydrated vegetables and fruits. Investigated were factors that affect quality, ascorbic acid content, and cost of processing such as methods of pretreatment, dehydration temperature, storage, and the reconstitution and preparation of the dehydrated food for the table. Findings were used during the war in food conservation programs.

Clothing and Home Equipment

Research in the Bureau also deals with the selection of clothing, household supplies, and equipment. Study of housework dress construction has led to the development of standards for such details as the size of stitches, the width of seams, and the treatment of fabrics in

edge finishes. The Bureau has also studied the fabrics and workmanship used in men's suits of different qualities and published some of the findings in a buying guide for consumers. Soaps and other detergents are present on the retail market in such variety as to be confusing. Little information is available concerning their relative merits for laundering and other household uses. Recently, however, the Bureau determined the soil-removing effectiveness of 15 soaps, 1 soap powder, and 35 synthetic detergents for the home laundering of cottons. It brought the results to the attention of homemakers, research workers, and manufacturers.

Other studies related to the standardization of test procedures for appraising the performance of electric range ovens in cooperation with a committee of the American Standards Association. Procedures standardized include the recipes and the mixing techniques for test products; specifications for utensils to be used; placement of products in the oven; time and temperature for baking; and acceptability limits for color and symmetry of baked products.

RESEARCH FINDINGS AT EXPERIMENT STATIONS

The State agricultural experiment stations reported many research findings. Acts of Congress authorize research appropriations for the experiment stations and require this Department to administer the Federal funds and report results. This is done through the Office of Experiment Stations, which also serves as the pivotal agency for the Agricultural Research Administration in the development of cooperation between departmental and experiment station research. Since passage of the Research and Marketing Act the number of cooperative projects between departmental agencies and the stations has grown, a particular feature being an increase in regional projects in which a group of stations and departmental bureaus engage in the joint planning of projects to meet major agricultural problems. After the work is planned, each station or bureau concentrates its efforts on that phase of the work for which it is best equipped.

Some of the more outstanding experiment station results, among them several developed in cooperative projects under the Research and Marketing Act, are reported here.

The use of radioactive phosphorus, in experiments by the Colorado, Iowa, New York, North Carolina, Georgia, and Maine stations and the Department of Agriculture, has shown a wide range of choice of phosphorus taken from fertilizer and that taken from the soil by different crops at various stages of growth. At the final sampling in one comparative test with three soils that contained respectively 71, 140, and 216 pounds of readily available phosphorus, cotton grown on the least fertile soil took 30 percent of its phosphorus from the fertilizer, and cotton grown on the most fertile soil took only 7 percent of its phosphorus from the fertilizer. These comprehensive studies with the use of the radioactive tracer methods give assurance that new techniques are being rapidly developed whereby farmers can make more efficient use of fertilizer and better and more scientific use of the soil resources on their land.

Plant-breeding science was put to work by the Texas Experiment Station in developing sorghum varieties that could be combined and

adapted to mass production and economical harvesting. Of the 18 varieties in last year's State certified list, 15 originated as experiment station selections. As a result of this work, production of sorghum grain has increased to an estimated value of a half billion dollars in the past 5 years.

The New Jersey Experiment Station announced isolation from soil samples of an organism producing neomycin, an antibiotic which, after methods have been found to produce it in crystalline form, may be highly valuable in medical practice. This recent addition to the growing list of antibiotics is relatively heat stable, is active against numerous bacteria that cause serious diseases such as tuberculosis, and has only a slight toxic effect on animals. The entire field of antibiotics, based on the simple principle of antagonisms among microorganisms, continues to amaze the world of science.

A cure of anaplasmosis, a serious blood disease of both dairy and beef cattle that costs American farmers millions of dollars in losses annually, is within sight as a result of discoveries made at the Oklahoma Experiment Station. In its search for drugs for treating animals, to which the disease is carried by ticks and several kinds of flies, the Oklahoma workers found that aricyl, an arsenical, when used alone cured 71 percent of the sick animals. When this drug was used in combination with quinoline diphosphate on 5 cows all of them recovered. Whereas anaplasmosis has been particularly prevalent in the Southern and some Midwestern States, it has been spreading into larger and larger areas, making this discovery particularly welcome to livestock farmers.

Comparisons of methods of reseeding ranges by the Utah station showed that forage yield could be increased from 5 to 15 times over that obtained where land was allowed to reseed naturally. Early spring seeding was more successful than fall seeding. Wheat grasses seeded in the spring showed up best. On irrigated pasture orchard grass, smooth bromegrass, tall oatgrass, alfalfa, Ladino clover, and red clover, in various mixtures, outyielded from 32 to 112 percent the old pasture varieties. The new mixture gave over 5,000 pounds of digestible nutrients per acre, equivalent to high-yielding alfalfa hay or corn silage grown on the same land. The Utah station estimates that seeding varieties found to be best adapted from these trials will enable Utah farmers and ranchers to put 5 million acres of land under these for more productive grasses.

Metabolism of Plants and Animals

In studies dealing with the metabolism of plants and animals, California Experiment Station workers have, for the first time, succeeded in producing in the plant simple sugars containing radioactive carbon. The California studies have brought scientific research a step closer to discovery of the life processes involved in photosynthesis. All life on the planet depends on this process, whereby energy from the sunlight reduces carbon from carbon dioxide in the atmosphere into simple sugars and other carbons. The California results were obtained by exposing plants in sunlight to an atmosphere containing carbon dioxide in which the carbon atoms were radioactive.

Several years ago the same laboratory discovered a method whereby crystalline sugar can be synthesized by the use of enzymes similar to those in nature. Until now, however, the behavior of simple sugars, like glucose and fructose, during the course of metabolism, could not be observed, as it was impossible to distinguish one sugar fragment from another. Use of the tracer technique, whereby radioactive carbon isotopes are incorporated in the sugar molecules, permits direct observation of the course of changes taking place in individual compounds. From the standpoint of immediate application, the California laboratory is also turning over to the Medical School of the University of California radioactive glucose for research aimed at finding how diabetic animals break down sugar.

Moisture in Corn

Moisture content of corn is an important factor in determining whether corn is eligible for the Government loan rate, designed to protect farmers against seasonal slumps in the cash price of the commodity. Eighty-five percent of farm storage cribs in Illinois were found ineligible for Government loans. The Illinois station conducted grain-storage investigations to help farmers overcome these shortcomings. The studies dealt with design and construction of corncribs, operation of driers, and methods for meeting storage needs, coupled with laboratory studies of exposed drying rates of grain. Application of the principles of improved storage coming out of the Illinois moisture-content and storage studies resulted in a gain of 38 cents per bushel in the case of one 2,000-bushel crib of corn.

Many Sciences Contribute to Findings

The Mississippi station reported further progress with the use of anhydrous water-free ammonia in liquid gas form as a fertilizer. About 1,000,000 acres of Mississippi cropland were fertilized with anhydrous ammonia in the 1948–49 fertilizer year. The station estimated that since this new method of fertilization was devised and applied in 1947 total farm income in the State has been increased about $75,000,000 by the use of anhydrous ammonia.

Missouri's southeastern counties have long needed a soybean variety that can be successfully grown in rotation with cotton. Soybeans previously grown in this section have been full-season varieties, well adapted to central Missouri, but usually low in yield in the Delta counties.

After 7 years of breeding from a selected strain, the Missouri station has developed the S–100 soybean, a medium-early, high-yielding, nonshattering, and nonlodging soybean with high-quality seed. Development of this new variety makes it possible for farmers in southeastern Missouri to get the benefits of soybeans in rotation with cotton and still harvest a sizeable crop of soybean seed.

Marketing Aids Developed

An electronic sizer with a capacity of 270 lemons a minute has been developed in a Research and Marketing project by the California

Experiment Station. The sizer operates on the principle of the electric eye. The "eye" registers the intensity of shadows cast by lemons of different sizes and shapes as they fall individually from a table through a narrow light opening. The amount of current flowing through the eye controls the opening and shutting of trap doors for six sizes of field-run fruit. A pilot model is already in use as a sampler for determining the producer's equity in shipments taken from both small and large lots. It promises to speed up materially the grading of lemons for size. The principle is now being applied experimentally to electronic color sorting.

The Georgia Experiment Station, cooperating with the Refrigeration Research Foundation and the Production and Marketing Administration in a project supported by Research and Marketing Act funds, carried on exhaustive studies on the keeping qualities of shelled peanuts with and without refrigeration. The research made possible an entirely new formula for handling peanuts in storage, including storage temperature, humidity, and ventilation control. Nuts kept in low-temperature storage were found to have superior flavor and color and were free from insect damage. Activated carbon was found effective in preventing odor absorption and in removing foreign flavor from the nuts.

As the information obtained in these studies gets into general use, peanuts and peanut products reaching consumers will be of much higher quality than in the past. With better quality peanuts, growers may expect increasingly larger demands. The annual peanut production in the 12 principal producing States is well over 2 billion pounds. Thirty-three States have storage centers where the part of the crop used for candy, roasted peanuts, and other food products is held for manufacturers.

The Texas station, as its part of a regional research project in which 8 States and the Department are cooperating, graded out 691,000 pounds of grease wool belonging to 59 patrons of the Sonora wool warehouse. The grading showed 50 percent of Fine staple wool, 39 percent of Fine French Combing wool, and 11 percent of Fine clothing wool. The graded wools sold for an average of 80.2 cents a pound whereas the "original bag" wools averaged 75.5 cents a pound, an advantage of 4.7 cents a pound in favor of the graded wools, a total advantage of $32,477 for the 59 lots of wool. If applied to the entire clip of Texas 12-month wool, this advantage would amount to $1,884,000.

Nutrient Proves to be Vitamin B_{12}

The hitherto unidentified food material in milk that was first reported in 1932 by the Bureau of Dairy Industry and called nutrient X, because of its unknown chemical nature, is undoubtedly vitamin B_{12}.

B_{12} is the name commercial chemists of one company gave to the material it recently isolated in crystalline form from liver extracts—the material that makes liver extract effective in the treatment of pernicious anemia.

A number of years ago investigators in the Bureau of Dairy Industry showed that nutrient X is essential for normal growth, development, reproduction, and lactation in laboratory rats. They found

nutrient X present in the nonfat portion of milk and in cheese, commercial casein, leafy foods and feeds, and liver extracts, but not in cereal grains and oil meals.

Nutrient X is so essential in the diet that rats grow very poorly without it, particularly on diets containing lactose, and usually die if it is lacking when the diet contains as much as 65 percent of protein.

When crystalline B_{12} first became available for purchase in March 1949, the investigators began a series of rat-feeding tests to determine the effects of feeding B_{12} in place of milk and other known sources of nutrient X.

The results of these tests showed that, so far as growth is concerned. B_{12} functions like nutrient X. Growth deficiencies in the rats due to lack of nutrient X were overcome by feeding either crystalline B_{12} or milk, nonfat milk products, leafy foods and feeds, liver extracts, or other food materials known to contain nutrient X.

B_{12} has the same effect on the utilization of high-protein diets as nutrient X, and the investigators concluded that possibly its fundamental function in the normal mammal is to facilitate the utilization of protein in the diet, especially high levels of protein. For example, the rats on diets containing 25 percent of protein made 54 percent of normal growth and those on diets containing 45 percent of protein made from 25 to 30 percent of normal growth, whereas those on diets containing 65 percent of protein failed to grow or died when they did not get nutrient X. When either nutrient X or B_{12} was fed with these various levels of protein, the effect on rate of growth was the same—that is, the rate of growth increased twofold on the 25-percent protein diet, somewhat over threefold on the 45-percent protein diet, and manyfold on the 65-percent protein diet.

Other research indicated that bacteria in the intestine of the rat synthesize nutrient X or some material having similar activity. Riboflavin (B_2) plays an important—if not a dominant—role in bringing about this synthesis. Evidence also indicates that cows may ordinarily synthesize nutrient X to maintain the potency of the milk.

Although B_{12} is the material that makes liver extracts useful in the treatment of pernicious anemia, milk and other food materials that are sources of nutrient X are not directly effective. This, however, may simply be because the nutrient X in these foods is not in a form easily utilized by the pernicious-anemia patient.

The investigators concluded that nutrient X or B_{12} undoubtedly plays a very important role in the nutrition of the normal mammal, that many of our foods and feeds are deficient in this nutrient, and that milk, nonfat milk products, and various kinds of cheese are particularly good sources of it. There is practically no nutrient X or B_{12} activity in white flour, enriched white flour, whole wheat flour, corn meal, wheat bran, or the cereals and cereal products in general, but the deficiencies in these foods can be overcome by supplementing them with milk or dairy products containing the nonfat portion of the milk, such as cheese, ice cream, and dried milk.

Vitamin Produced in Crystalline Form

One large pharmaceutical laboratory has announced, within the last year, that B_{12} is being produced in crystalline form. The microbio-

logical work that led to its preparation was done in the poultry department of the Maryland Experiment Station. Much of the basic research leading to discovery of the existence of this vitamin was conducted by United States Department of Agriculture research workers. B_{12}, which increases the metabolism of proteins and thus increases growth rate, shows great promise in combating pernicious anemia in human beings and it aids in the nutrition of human beings, chickens, and livestock. Its proper use in rations is expected to result in greater economy in the production of milk, eggs, red meats, and poultry meat. In the human diet it should make possible the inclusion of relatively higher proportions of the less expensive proteins, thereby benefiting millions of people in lower-income brackets.

The Department's Office of Experiment Stations has received reports on studies completed at the Iowa, Michigan, and several other State experiment stations in which the unidentified growth factor (now identified and synthesized as B_{12}) was used in swine-feeding experiments. In these experiments vitamin B_{12} concentrates, not the synthetic product, were fed. The Iowa study showed that adding concentrated APF (animal protein factor) supplements produced up to 24 percent faster gains, finished the pigs for market up to 20 days earlier, and saved up to 10 percent of the feed required to produce 100 pounds of pork. The report says that "vitamin B_{12} appears to be one of the important components of the animal-protein factor. It appears that the vitamin B_{12} requirement for growing, fattening pigs is around 10 micrograms per pound of total ration."

EXTENSION EDUCATION

Broadened and deepened during the years, extension work reached increased numbers of rural people. Extension workers helped farm people to use numerous developments in agricultural technique, such as new insecticides, better and more abundant supplies of fertilizer, improved machinery, and improved ways of conserving soil, water, and desirable vegetation. Extension agents gave attention also to agricultural marketing. Increased availability of electricity to farm homes involved new extension duties. Greater availability of building materials added to the extension work-load; more rural people asked for help with building. There was added interest in rural health with a resulting increased demand for extension help. Farm men and women showed more interest than previously in agriculture's long-time program and in related problems of world peace, international relations, and international trade. All such matters entered into the education program. Many urban people took advantage of agricultural extension facilities for various purposes.

There is today almost world-wide interest in the way this country, through cooperative extension work, is bringing the results of research and experience to farm people.

Two hundred twenty-eight farm leaders from 41 countries have been studying extension work here during the last year. This brings to 572, from 62 countries, the number of persons who have had such training here in the last 6 years. About 40 of our extension leaders have been asked to go to other countries to study or help establish extension services. There has also been wide interest in an interna-

tional farm youth exchange, which during the year sent 31 older 4–H Club members to 10 European countries and brought the same number of youths from those countries here to live on our farms for several weeks.

This world-wide interest is a fitting complement to our system of extension work. It also offers us practical opportunities to assist the people of war-torn and under-developed areas to help themselves through an exchange of techniques and methods in line with President Truman's Point 4 program.

Though the Extension Service is not an international agency, it does have an important educational responsibility to help the farm people of this country understand the world situation. Extension workers have been alert in using the many foreign visitors and exchange students in extension meetings and other programs to help our people better understand the problems, customs, and ways of living of other countries.

The Extension people who have come back from their foreign assignments all tell about the same story. The kind of service we call extension is badly needed in most countries. Research is not fully productive without teachers to help get it applied on farms and in homes. But to try simply to transplant our system of extension to other countries would contradict its most basic principle. Extension must grow out of the desires of people, in line with their cultural pattern and their specific needs.

Extension principles and experiences as they may relate to various areas of the world were brought together last May. The Office of Foreign Agricultural Relations and the Extension Service sponsored a conference on extension experiences around the world. It was attended largely by extension and OFAR people who have been on missions to other countries, agricultural attachés, Food and Agriculture Organization representatives, foreign missionaries, and others directly interested. A report of the conference is being printed.

6½ Million Families Helped

Cooperative extension agents during the year carried research and other information to 6½ million families who used it in adopting improved farming and homemaking practices. The total of 4½ million farm families that adopted practices demonstrated and recommended by extension agents was about the same as during the last 4 years and in the 5 years preceding the war. The 2 million city and other nonfarm people who adopted recommended practices was a slight increase over the preceding year. The number was twice that reached in 1941 and three times that reached in 1936. There was a 12-percent increase over the preceding year in the number of nonfarm homes having 4-H Club members, and a 7 percent increase in the number of nonfarm families helped with marketing, consumer education, and other homemaking problems. There was a slight increase in the nearly 2 million farm families assisted with homemaking practices.

Record Number of 4–H Club Members

The number of boys and girls in 4–H Club work—1,829,250—was 4 percent more than the preceding year's record number. It was 17

percent more than in 1945, when Congress passed the Bankhead-Flannagan Act providing more funds for extension work with emphasis on 4–H Club expansion. Since 1945, 310 additional county workers designated specifically as 4–H Club agents and assistants have been added.

During the same time, 2,188 additional county agricultural, home demonstration, and assistant agents have been added. Many of these assistant agents are assigned essentially full time to 4–H Club work. Also the percentage of time that all agents spend on club work increased from 31 to 36 percent from 1945 to 1948. Cumulatively, this increased time and personnel directed to 4–H Club work is equivalent to the addition of over 900 additional 4–Club agents during this period. These facilities enabled county workers to increase 4–H Club enrollments. Members continued their club work somewhat longer and more members carried projects through. The records show that the average 4–H Club member now stays in club work about 3 years, and the percentage staying in 4 years or more has doubled in recent years.

Program for Young Men and Women

The Extension Service prepared a stronger program to reach young men and women between 18 and 30 years of age. Most persons in this age group have left the 4–H Club program. Studies in a number of States show, however, that they do not make as much use of adult extension work as do people over 30. Hence the new program aims to bridge the gap.

Cost of the cooperative extension program during the year was about 65 million dollars. State and county funds provided about 53.5 percent of this money; the rest was from Federal sources. State and county funds for extension work have increased more in recent years than Federal funds. There was a national average of three agents per county.

THE GRADUATE SCHOOL

Completing its twenty-eighth year, the Department's Graduate School continued its contributions to the improvement of the service. It cooperated with Department bureaus and agencies in providing education toward advanced degrees, in maintaining intern and other programs cooperatively with land-grant colleges and other institutions, in helping employees to qualify educationally for promotion, and in enabling advanced employees to keep abreast of new technical developments in their fields.

As the Department's functions have multiplied and widened, the Graduate School has developed correspondingly, both as an educational institution and as an education service agency. In Washington it offers a large institutional program, which employees and others may attend after working hours, at their own expense. About 5,000 persons are taking advantage of this program. To carry it out along with other activities, the Graduate School maintains 8 instruction departments, each under the supervision of a committee drawn from the Federal service and elsewhere. The faculty numbers more than 200

persons, most of whom have had university training, as well as day-to-day practice in their subjects. Besides the after-hours program, the school gives some courses and seminars during work hours. Also it operates a correspondence study program for the field service.

Among its service activities, the school takes part in work-study programs for cooperative extension employees, in cooperative intern arrangements for graduate students and faculty members from land-grant and other institutions, and in educational opportunities for foreigners here for training. In addition, the school provides lecture courses. In 1949 these included a series on the utilization and conservation of resources, one on economic recovery and world politics, one on the foreign policies of the great powers, and one on Latin America. They were recorded by the Voice of America for rebroadcast. Also, the Graduate School worked with universities to provide educational opportunities for the Department's field force.

Management of the school is the responsibility of a general administration board appointed by the Secretary of Agriculture. A director and a small staff do the administrative work. In 1949 a committee representative of the Department of Agriculture, of the land-grant colleges, and of the Office of Education considered long-range plans. After making studies, with the help of the Department's bureaus and offices, the committee offered recommendations. In particular the committee drew attention to the need for more work by the Graduate School on behalf of the field service, in cooperation with the land-grant colleges and other agricultural institutions, and for more emphasis on the educational needs of foreigners who come to the United States for agricultural training. In line with these recommendations the Department has drafted legislative proposals.

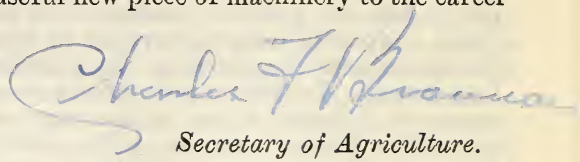
THE DEPARTMENT'S PERSONNEL

The Office of Personnel helped the Department's bureaus and offices to achieve better selection, management, and conservation of personnel resources. It worked closely with the Civil Service Commission, the Bureau of the Budget, and the Federal Personnel Council. In a letter to the Department the Civil Service Commission commented favorably on the results of an inspection which covered personnel operations in 22 agencies and in the Department's staff offices.

Spreads between prices paid to farmers for farm products and prices paid by consumers for such products called for more analysis of this relationship. One development was increased emphasis on the training of personnel for marketing research. In April a joint committee, representative of the Department and of the land-grant colleges, examined this problem and appointed a subcommittee to draft recommendations. Research in progress under the Research and Marketing Act of 1946 has yielded important benefits already, but at the same time has brought new marketing problems to the fore. Necessarily, this work has revealed a shortage of qualified research people.

The Department's examination program resulted in an almost complete conversion of war-service and temporary employees to civil-service status in positions for which the Department has examining responsibilities. The Department's field placement committees began

work in the fiscal year 1949; they proved valuable in reassignment and placement operations. It is almost impossible to administer a Nation-wide program of reassignment and placement through individual negotiations with officials appointed for different areas. Adoption of the field-placement committee system should simplify the task materially, and add a useful new piece of machinery to the career program.



Secretary of Agriculture.

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